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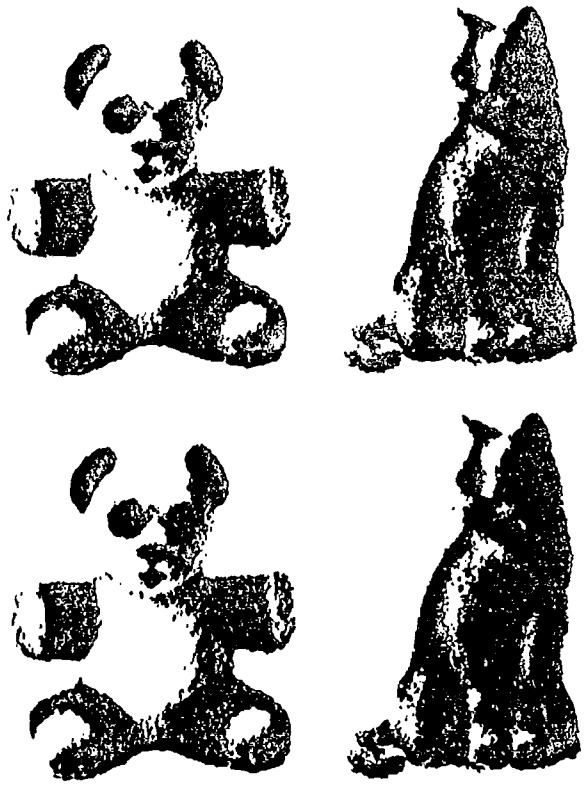
ABSTRACT

This book is the teacher's manual to a text designed to meet the particular needs of those children who have "accumulated discouragements" in learning mathematics. It is a manual of suggested teaching strategies and additional materials aimed at compensation for past student failures to understand mathematical concepts. This book, D, is designed for the second-grade mathematics program. Individual chapter titles are: Geometry 1: Addition and Subtraction: Weight, Time, and Money: and Numbers (Renaming Ones, Tens, Hundreds). (MP)

MATHEMATICS Book D



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PREFACE

The teaching strategies and mathematics materials suggested in this teacher's manual and the accompanying mathematics books for children are part of the Southwest Educational Development Laboratory's Mathematics/ Science Program.

Users of these adapted materials have the opportunity to revise and improve them in the light of experience and evaluation of results of their effectiveness in the classroom. This interaction of program designers and writers with teachers and pupils is consistent with the process of educational development -- the continuous improvement of materials and techniques. As these materials are pilot tested, the teachers' experiences with them have almost instant impact on their continuing revision and improvement.

Designed to compensate for pupils' past failures to understand mathematical concepts, the Southwest Educational Development Laboratory's Mathematics/Science Education Program takes into account the social and cultural background and cognitive skills a student brings to the learning situation.

This book, Mathematics, Book D, includes adaptations of the mathematics program commonly experienced in the second year of school. It is one of four books, C, D, E, and F, for this level. The adaptations are designed to meet the particular needs of those children who continually have been discouraged in learning mathematics. To meet this need, the reading level required of of the pupils has been reduced. More importantly, meaningful mathematical experiences are presented in ways which give the pupil many opportunities for success.

As in any sound educational program, the role of the teacher is critical. A teacher's interest and enthusiasm are contagious to students, but interest and enthusiasm are dependent upon the teacher's assessment of his own competence. This guide is designed to assist the teacher in directing classroom activity and in developing an understanding and appreciation of the mathematical concepts and skills to be taught.

The following premises guided the team of teachers and mathematicians who adapted and wrote these materials:

- Unnecessary use of vocabulary which has no meaning for children can be avoided.
- Teaching mathematics requires patience, purposeful planning, and opportunity for learning.
- Mathematical experiences can be adapted to children rather than adapting children to mathematical experiences.

The Laboratory's Mathematics Program has been expanded to include Science. Long range plans include adapting science materials to meet the needs of pupils who have failed to respond to traditional materials and teaching approaches.

Edwin Hindsman
Executive Director

ACKNOWLEDGMENTS

These materials were prepared by the Southwest Educational Development Laboratory's Mathematics Education Program during two summer writing conferences. The 1968 Summer Mathematics Writing Conference participated in the initial adaptation of these materials, and the 1969 Summer Mathematics Writing Conference participated in their revision.

The 1969 Summer Mathematics Writing Conference, held in Austin, Texas, was coordinated by Floyd Vest, Professor of Mathematics Education, North Texas State University, Denton, Texas. He was assisted by James Hodge, Professor of Mathematics, North Texas State University, and Palma Lynn Ross, Department of Mathematics, University of Texas at El Paso.

Participants for the 1969 writing conference included: Carmen Montes, Santiago Peregrino, Rebecca Rankin, Rudolph Sanchez, and Flora Ann Sanford, El Paso Independent School District, El Paso, Texas; Jimmye Blackmon, J. Leslie Fauntleroy, Barbara Graham, and Sophie Louise White, East Baton Rouge Parish Schools, Baton Rouge, Louisiana; Lawrence A. Couvillon and James Keisler, Louisiana State University, Baton Rouge, Louisiana and Socorro Lujan, Mathematics Education, Southwest Educational Development Laboratory, Austin, Texas.

Consultants for this conference included: Sam Adams, Louisiana State University, Baton Rouge, Louisiana; James Anderson, New Mexico State University, Las Cruces, New Mexico; R. D. Anderson, Louisiana State University, Baton Rouge, Louisiana; Robert Cranford, North Texas State University, Denton, Texas; William T. Guy, Jr., University of Texas at Austin, Austin, Texas;

Lenore John, School Mathematics Study Group, Stanford, California; Houston T. Karnes, Louisiana State University, Baton Rouge, Louisiana, and B. G. Nunley, North Texas State University, Denton, Texas.

The 1968 Summer Mathematics Writing Conference was coordinated by James Keisler, Professor of Mathematics, Louisiana State University. Participants for this conference included: Stanley E. Ball, University of Texas at El Paso, El Paso, Texas; Lawrence A. Couvillon, Louisiana State University, Baton Rouge, Louisiana; Rosalie Espy, Alamo Heights Independent School District, San Antonio, Texas; J. Leslie Fauntleroy, East Baton Rouge Parish Schools, Baton Rouge, Louisiana; Norma Hernandez, University of Texas at Austin, Austin, Texas; Glenda Hunt, University of Texas at Austin, Austin, Texas; Carmen Montes, El Paso Independent School District, El Paso, Texas; Santiago Peregrino, El Paso Independent School District, El Paso, Texas; Rebecca Rankin, El Paso Independent School District, El Paso, Texas; Ida Slaughter, East Baton Rouge Parish Schools, Baton Rouge, Louisiana; and Sister Gloria Ann Fielder, CDP, Our Lady of the Lake College, San Antonio, Texas.

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Mathematics Education Program Staff

Rex Arnett, Program Director
E. Glenadine Gibb, Program Director
1968-69
Thomas H. Scannicchio, Coordinator.

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UNIT 3
Geometry I

OBJECTIVES:

1. To review recognition of simple geometric figures according to description and to shape.
2. To review simple closed curves.
3. To review the idea that polygons can be classified and identified according to the number of sides.
4. To review the idea of open paths and closed paths.
5. To review the ideas of inside and outside and to associate these ideas with closed paths.
6. To review the classifying of regions and compare regions to simple geometric figures.

BACKGROUND INFORMATION FOR TEACHERS:

This unit is devoted to the subject of geometry. It is written in such a manner, that it can serve as a review unit for material already presented in the first grade, or as an introductory unit to help children become familiar with what their study of geometry, in later units, in this text, will entail.

The activities in this geometry unit are designed to help children:

(1) classify and describe simple geometric figures according to shape

(2) recognize the difference between open curves (paths) and closed curves

(3) associate the ideas of inside and outside with closed curves

(4) classify polygons according to the number of sides

(5) distinguish rectangles and squares from other quadrilaterals

(6) learn to classify and compare regions

In this unit extensive use is made of objects from the physical world. The materials are the means by which children begin to abstract geometric concepts. By observation and by tracing the edges of objects with their fingers, children begin to distinguish between surfaces that are round and those that have sides and corners.

Some children, at this grade level, may not yet have acquired the ability to distinguish a circle from a square, since both of these figures are closed curves. Thus, in the work presented in this unit, children are asked to classify shapes according to their edges (round or sides and corners). Then reference is made to the words, rectangular, triangular, and circular in relation to the number of sides and corners of the shapes.

The terms inside and outside, which are familiar to primary children, serve as a means of preparation for the later introduction of interior and exterior (in another grade).

By working with models of triangles, circles, rectangles, and line segments, the children should acquire a better understanding of the ideas of closed curves and curves that are not closed (open curves).

Among the important activities presented in this unit are those that involve comparisons. Objects having the same geometric shape are compared, a simple closed curve together with its interior is compared and classified

and is referred to in terms of the name generally associated with this particular curve - such as a rectangular region, a circular region, a triangular region, and so on. The terms rectangular, circular, and triangular indicate that a simple closed curve is, respectively, a rectangle, a circle, or a triangle.

For a more detailed description of the terms used in this unit, read the Background Information for Teachers Geometry II, Unit 9.

TOPIC I: RECOGNIZING THE SHAPES OF FIGURES ACCORDING TO THEIR DESCRIPTION

OBJECTIVE:

To lead children to recognize distinguishing features of figures that are round, have sides (edges) or corners.

VOCABULARY: shape, round, face, edge, corner

MATERIALS: 3 different size balls, 3 different size boxes and blocks, plastic containers having the shape of objects such as balls, boxes or blocks, chalkboard, 3 sacks - (70 pieces in each sack) containing wooden geometric shapes (various sizes and shapes), tagboard cutouts of geometric shapes, pictures of different objects: a drum, a book, a ball, a can, a box, etc., pupil pages 1 - 3

Activity 1: Reviewing the classification of simple shapes

Pupil page 1

Objectives:

1. Given a set of common objects a child can identify and classify them according to their shape.

2. Given a set of objects having common shapes, a child can describe these objects using the terms edges, flat sides (faces), corners, round, rectangular, etc.

Materials: 3 balls (L,M,S), 3 boxes, 3 cans (L,M,S), wooden geometric shapes (L,M,S), tagboard, geometric 9" by 12" cutouts, pictures of different objects, pupil page 1

Teaching Procedure:

To provide a review of simple shapes place a ball on a table, a box on a chair, and a cylindrical can on the chalkrail. Give each child about 5 different geometric shapes. Pointing to one of the three objects (ball, box, can) ask the children to find any objects among their five objects that have the shape of the ball. Have the children look through all their objects and identify those that have the shape of a ball. Then have them come up and place their objects beside the ball on the table. Follow the same procedure for objects shaped like boxes and shaped like cans. After the sorting is completed, the children should identify what the objects in each set have in common by saying, "These objects have the shape of a ball, a box, or a can." The teacher can help the children become more aware of these different shapes by picking up the box and using her hand to trace the box and saying: "The box has edges. The box has corners. The box has flat sides." Ask the children to look around the room and see if they can find other objects or pictures of objects that have flat sides and corners. Continue reviewing the recognition of the shapes of figures (ball and can shaped objects) using the same procedure - but using the terms "has edges but no corners" for can-like shapes and "has no edges nor corners" for ball-like shapes.

Ask the children to open their books to pupil page 1. Tell them that they are to trace the figures with their finger and then tell which figures are round and which ones have sides and corners.

Activity 2: Identifying and classifying objects of common shape through manual examination

Pupil page 2

Objective:

Given a set of objects with geometric shapes, a child can describe these shapes through manual examination.

Material: several wooden geometric shapes, large geometric shaped cutouts, pupil page 2

Teaching Procedure:

Ask a group of 8 children to stand at the front of the room facing away from the class with their hands behind their backs. Then ask another group of 8 children to take any geometric shape (wooden or tagboard) from the table and place their choices in the hands of the children standing at the front of the room and ask: How does it feel? (Like a box, round like a can, or round like a ball) Does it have edges? corners? flatsides? (about boxes) Does it have edges but no corners? (about a can) Does it have no corners and no edges? (about balls)

The children at their seats are to listen for the correct answer, if an incorrect response is made, they are to provide the correct response in chorus. Ask the children to open their books to page 2. Say that they are to look at the picture to the left of the page and then draw a matching picture on the space to the right. Then have a child read the directions for the exercise at the bottom half of the page and ask the children to complete the page.

Activity 3: Further practice in identifying and describing geometric figures through pictures

Pupil page 3

Objective:

Given picture of objects, children can associate the picture with the objects and with the geometric figure they represent.

Materials: picture of different objects (a drum, a book, a bowl, a kite, a crayon, a baseball, a bar of soap) and the objects mentioned in Activity 2, chalkboard, pupil page 3

Teaching Procedure:

Write on the chalkboard the following lines:

Has sides and corners.

Has no sides and no corners.

Has sides and no corners.

Has the shape of a ball.

Has the shape of a box.

Has the shape of a can.

Is round.

Divide the class into 2 equal groups. Have one group hold the pictures of the objects. Have the other group hold the objects. Have the group holding the objects describe the objects by saying or reading from the chalkboard any of the phrases that best describes their object. Then have the group holding the pictures match their picture with the object that best describes it, then say: I have a match because my picture is round and it has no corners or sides, etc. Then for additional practice let children do pupil page 3.

TOPIC II: REVIEWING SIMPLE CLOSED CURVES

OBJECTIVE:

To review the classification of some simple closed curves.

VOCABULARY: straight, rounded, circle

MATERIALS: balls, boxes, cans, models of circles, triangles, rectangles, triangles from rhythm instruments, rectangular picture frames, circular embroidery hoops, rubber bands stretched around pegs on a pegboard (or nails in a piece of ceiling tile), models made from wire or starched string, chalk and string for drawing circles on the chalkboard, flannel board and flannel geometric shapes (circles, oblongs, pentagons, rectangles, triangles, and other simple closed curves)

Activity I: Distinguishing between straight and rounded figures

Objective:

Given a set of objects with geometric shapes, a child can recognize and make a distinction between straight and rounded figures.

Materials: flannel board, flannel geometric shapes, balls, boxes, cans, rectangles, triangles, hoops, pegboard, and wire models

Teaching Procedure:

Display on the flannel board the different polygons and other simple closed curves (include at least three circles). Ask individual children as you point to a circular figure to describe its shape. (It is rounded.) Ask them if it has any corners. (No) Follow the same procedure as you point to rectangles and triangles. The children should be able to say that the sides of both of these polygons "are straight and not rounded."

Then display the balls, the cans, and the boxes. Show the children the rounded seam of the ball, the rounded rims of cans, and the straight lines of boxes. For further practice point to objects around the room like a wastebasket or clock, the desk or window or the door and ask the children to tell if these physical objects are rounded or have straight sides.

Activity 2: Distinguishing circles from other rounded shapes

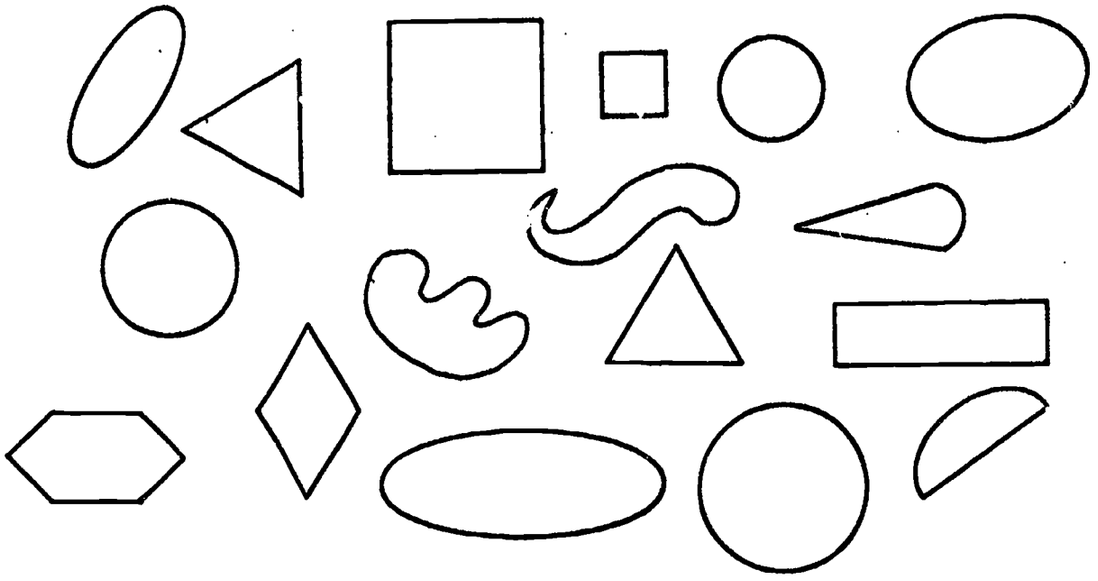
Objective:

Children can identify circles from a collection of geometric figures.

Materials: The same as for Activity I

Teaching Procedure:

Direct pupils' attention to geometric figures displayed on the flannel board. The flannel board should look as pictured below:



Ask individual children to come to the flannel board and remove a figure with straight sides. As they remove the figure have the children say "This has straight sides." When all the polygons have been removed,

consider the figures that are left on the flannel board one by one and ask the children to tell what their shape is. (They are all "rounded figures".) Pick out a circle and say, "This is a rounded figure and it has a name." Ask the children if they can name the figure. (It is a circle.) Ask the children if all the figures displayed are circles. (No) If the children encounter difficulty, have them fit a flannel circle over each of the "rounded" figures on display. Lead the children to see that the circle is a special figure which looks the same from every direction.

Pass out the circle wire models to the children. Let them trace its sides with their hands to find that the shape is the same everywhere.

TOPIC III: REVIEWING POLYGONS: TRIANGLES, QUADRILATERALS (RECTANGLES AND SQUARES) AND PENTAGONS

OBJECTIVE:

To recognize and identify polygons according to their sides.

VOCABULARY: triangle, rectangle, square, *pentagon, *quadrilateral

Note: *starred words may be introduced if children are on grade level. It is left to the teacher's discretion to make the choice.

MATERIALS: boxes, wire forms of triangles, rectangles, and other polygons, rubber bands stretched around pegs on a pegboard, sticks and straws of various lengths, magnetic geometric shapes and a magnetic board, chalk and chalkboard, geometric shaped cutouts

Activity : Recognizing polygons with 3 sides, 4 sides, and 5 sides

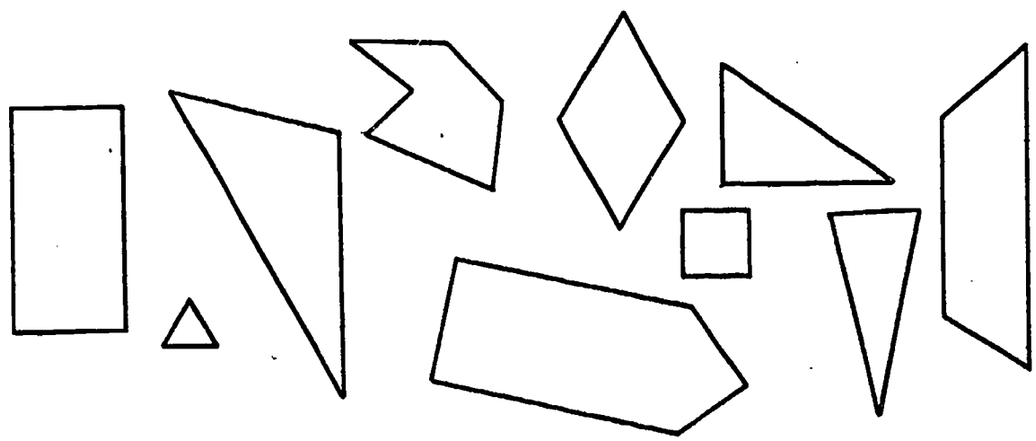
Objectives:

1. Children can identify triangles, rectangles, squares, and pentagons from a collection of figures according to their sides.
2. Children can name the polygons: triangles, rectangles, and squares among a collection of figures.

Materials: magnetic geometric shapes, magnetic board, chalk and chalkboard, wire geometric forms, various lengths of sticks and straws cut so that two shorter sticks have a combined length greater than the longest (to help children in constructing triangles)

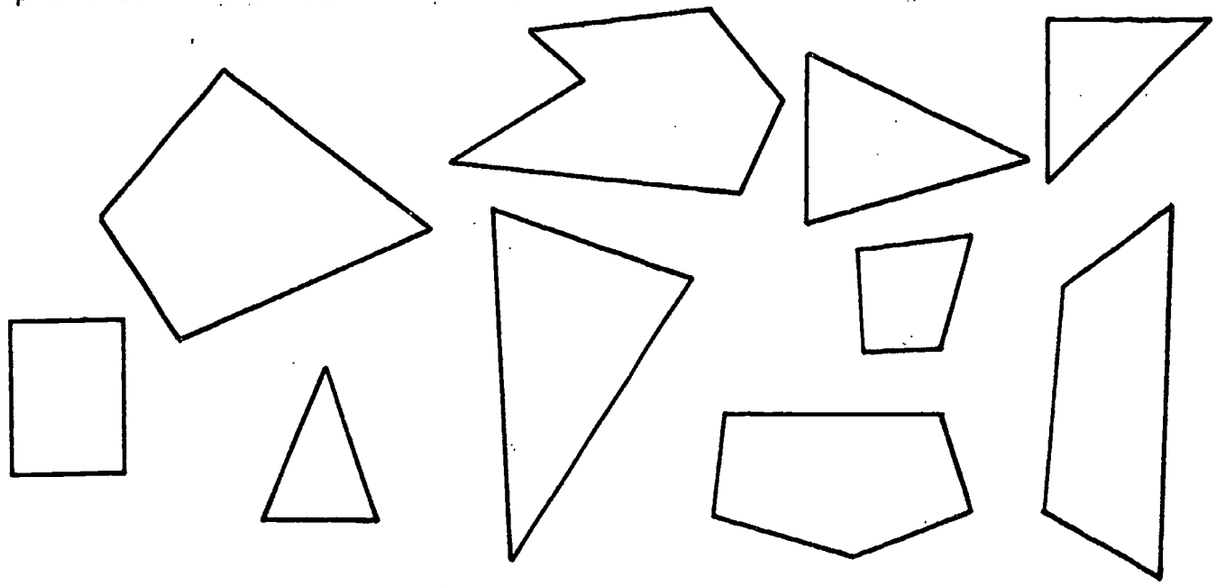
Teaching Procedure:

On the left side of the chalkboard, draw several polygons (three triangles, three quadrilaterals, and a few polygons with five or more sides). The chalkboard should look as pictured below:



On the magnetic board display circles and other "rounded" figures. Ask the children how this set of pictures on the chalkboard is different from the figures on the magnetic board. (The pictures on the chalkboard have straight sides or edges. The pictures on the chalkboard have sides and corners. The pictures on the chalkboard are not round.)

Accept any of the above responses. Point to the triangle drawn on the chalkboard and as you trace the sides have the children count them. Then say, "This is a triangle. How many sides does it have?" (3 sides) Ask a child to come to the chalkboard and write the numeral 3 inside the triangle. Point to any quadrilateral on the chalkboard and as you trace its sides have the children count them. Then say, "This is a quadrilateral. How many sides does it have?" (4 sides) Have another child come to the chalkboard and write the numeral 4 inside the quadrilateral. Then consider the remaining figures in turn, getting the children to agree on the number of sides, and writing the numeral inside the figure. For five or more sides it is enough to tell the children that they have special names - you might mention them but it is not necessary for the children to learn them. (Possible exception: pentagon) The chalkboard pictures should look like this:



Display the wire geometric forms and the rubber band on pegboard models of polygons. Have individual children trace their edges, count them

and classify their shapes by saying:

This has 3 sides.

It is a triangle.

This has 4 sides.

It is a quadrilateral.

For additional practice supply sticks or straws of various lengths for children to make triangles and quadrilaterals.

Activity 2: Distinguishing rectangles and squares from other quadrilaterals

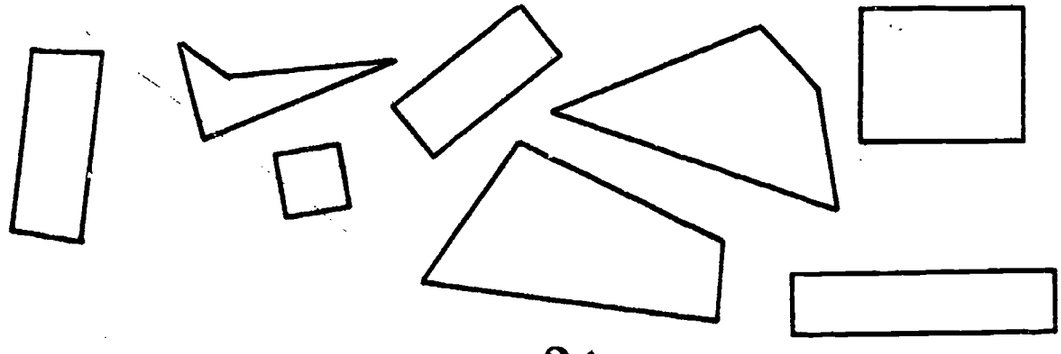
Objectives:

1. Given a collection of quadrilaterals, children can make the distinction between rectangles and squares.
2. Given a collection of quadrilaterals, which are not also squares, children can distinguish rectangles (and squares) from other quadrilaterals.

Materials: geometric wire forms, magnetic geometric figures, and flannel geometric pieces, magnetic board, flannel board, and chalkboard

Teaching Procedure:

Have drawn on the chalkboard geometric shapes like the ones below and place a magnetic triangular-shaped figure on the magnetic board.



Draw the children's attention to the figures or the chalkboard and then to the single triangular figure on the magnetic board as you ask, "How are these pictures on the chalkboard different from this figure on the magnetic board?" (Each has four sides.) (If children have difficulty in recognizing this, have them come to the chalkboard and count the sides of the figures on the chalkboard and write the numeral inside the figure.) Say to the class, "Yes, all the drawn figures have 'four sides' but can you see something that makes some figures different or special in another way?" Display the wire rectangular form and the flannel rectangular shaped figure and say, "These are the special figures we are looking for. Can you come to the chalkboard and place a ring about the special figures that look like mine?" Have several children come to the chalkboard and ring the rectangular figures. (This will include all the squares, too.) Say, "These are rectangles." Display the wire square rectangle and tell the children that this is a special rectangle. Have several children come to the chalkboard and ring the special rectangles. (The squares will now have two rings around them.) Say, "Can you tell why they are special rectangles?" Lead children to the idea that in a special rectangle, all four corners "look alike" and all the sides are of equal length. Tell the children, "That this kind of rectangle is called a square rectangle but for short, we call it a square." Draw the children's attention to the rectangles on the chalkboard that are not squares and ask the children how these rectangles are different from the special rectangles (squares). (The four corners "look alike" but the sides that make the corners are

not of equal length.) Ask several children to trace the sides of rectangles that are not squares to help them see this idea more clearly.

TOPIC IV: OPEN AND CLOSED PATH (CURVE)

OBJECTIVES:

1. To review the idea of path as open or as closed through the use of geometric shapes.
2. To illustrate with the use of geometric shapes a closed path and an open path.

VOCABULARY: closed, inside, open, outside, path, starting point, neither

MATERIALS: yarn (1 ball), flannel board, flannel objects (uncommon and common geometric shapes, individual flannel boards, string; pupil pages 4 - 7

Activity 1: Reviewing closed paths

Objective:

Given a collection of geometric figures, a child can recognize and describe closed paths.

Materials: felt strips, felt objects (uncommon and common geometric shapes), a flannel board, 2 one inch red felt and 2 one inch yellow felt arrows

Teaching Procedure:

Review with the children the meaning of the word path by asking the children how they go to the cafeteria and back to their classroom. Then have several children walk from their seats to the pencil sharpener and

back to their seats or have them start from their seats, walk along the four walls and back to their seats. Ask: "How did (name of child) get to the pencil sharpener?" (He walked this way or around that way; child points with his arm.) Accept any reasonable answers. Say: "Yes, everyone took a different way or the same way to get to where he was going and to return to his seat. We use the word path 'because it means a way to go' when we go from one place to another." Have several children demonstrate the paths needed to go from their seats to the window and from one corner of the room to the opposite corner. Let them use different starting places. Then say: "What if I told you to walk from your seat to the pencil sharpener and back to your seat without turning around, could you do it?" (Yes) "Why?" (We just keep on going around the room in the same way until we get back to where we started; we do not change direction along the path; we do not walk back on the same path.) Explain that this is a special kind of path (a closed path) because each child was able to get back to his starting place without changing direction along the path, retracing any steps, or touching or crossing any part of the path previously traced.

Note: 1) The preceding paragraphs for introducing paths can be used as an introductory lesson on paths or as a review lesson depending on the type of class the teacher has. 2) We are using the name closed path (or closed curve) as an abbreviation for simple closed plane curve. Strictly speaking there are closed plane curves which are not simple (for example,  and ). It is recommended that the

general closed curves not be used for examples and that this work be restricted to closed curves which are also simple.

Then display on the flannel board a flannel circular figure and use questions and comments like the following: "Let's see if this circle shows a closed path. I am going to use a red felt arrow to mark a starting point in the path. Joe, place your finger on the starting point and move it along the path and see if you can come right back to this starting point (where the red arrow is)." Ask the class: "Did Joe come back to the starting point?" (Yes) "Did he have to cross, touch, or retrace any part of the path?" (No) "What kind of path is it?" (A closed path) Repeat the above procedure by using other geometric figures (rectangles, which are not also squares, squares, and triangles). Lead the children to the idea that all the geometric figures mentioned in this activity are closed path figures.

Activity 2: Introducing the idea of open paths as related to circles and polygons

Pupil pages 4 and 5

Objective:

Given a collection of geometric figures a child can recognize and describe open paths.

Materials: flannel board, felt geometric figures, yarn, the flannel arrows used in Activity 1, individual flannel boards, 12" pieces of yarn per child, pupil pages 4 and 5

Teaching Procedure:

To introduce the idea of an open path, display on the flannel board a circular figure made with the yarn. Direct the children's attention

to the figure, separate the ends of the yarn, and mark the end points with the yellow felt arrows. Hand a child a red felt arrow and have him mark a starting point. Ask another child to place her finger at the starting point (red arrow), and then to trace the path from there. (Remind the children that they are not to go back over any part of the path they have traced and that they must stay <u>in</u> the path.) Then ask: "Class, did (child's name) get back to her starting point?" (No) "If (child's name) stays in the path, what must she do to get back to the starting point?" (Move back along the path or go back the same way she came.) Accept any reasonable answer. Then say: "We call this kind of path an open path." Explain that: "In an open path, you cannot get back to the starting point unless you go back along the path or retrace your steps."

Have the children select other starting points on the circular figure and have various children show by tracing the path that they can return to the starting point only by going back along the path. Follow the same procedure using rectangular and triangular figures, this time to find open paths.

Then let children do pupil pages 4 and 5.

<u>Activity 3</u>: Illustrating closed and open paths Pupil pages 6 and 7

<u>Objective</u>:

Given the materials, a child can illustrate or construct open paths and closed paths.

<u>Materials</u>: Individual flannel boards, 12" lengths of yarn or string, 1 for each child (Note: the teacher can use either string or yarn.) pupil pages 6 and 7

Teaching Procedure:

Give each child a small flannel board and a 12" length of yarn or string and at your direction have the children illustrate closed paths and open paths. Say: "Pick up the piece of yarn from one end and let it drop onto the flannel board." (Teacher illustrates with her own flannel board and piece of yarn.) Ask: "What do you have, an open path, a closed path, or neither?" Each time a path is illustrated, have the children verify that, after moving along an open path, they can reach the starting point again only by going back along the path; whereas in a closed path they can move in only one direction, going all the way to the starting point without retracing steps or crossing or touching any part of the path previously traced.

To reinforce these ideas of closed and open paths, use pupil pages 6 and 7. Lead the children to decide whether a closed or open path is illustrated and then have them verify their conclusions by tracing the paths with their fingers.

TOPIC V: ASSOCIATING THE IDEA OF INSIDE AND OUTSIDE WITH CLOSED PATHS

OBJECTIVE:

To relate the idea of inside and outside to closed paths through the use of illustrations of simple geometric figures or objects.

VOCABULARY: *inside, *outside, cross-across

Note: The words are starred to indicate that an assumption is made that the children have an understanding of the everyday use of these terms from past experiences. However, it is left to the

teacher's discretion to determine whether to introduce these words as new vocabulary.

MATERIALS: flannel or magnetic boards, felt geometric shapes and felt objects (balls, cots, trees, birds, leaves, yarn, etc.)
pupil pages 8 - 9

Activity 1: Introducing the inside and outside of closed paths

Pupil pages 8 and 9

Objective:

Children can point out the inside and outside of a closed path.

Materials: flannel board, felt objects (trees, birds, cats, balls, etc.), pupil pages 8 and 9

Teaching Procedure:

With strands of yarn show representations of a circle, a triangle, and a rectangle (square) on the flannel board. Ask the children what kind of paths they see in each of the yarn representations. (closed paths) Then place a felt tree inside the closed path (the circle) and the felt bird outside the (circle) closed path. Then proceed with the following questions. "Is the tree inside the closed path (circle) or outside the closed path (circle)?" (inside) "Is the bird inside the closed path or outside the closed path?" (outside) Ask a child to place her finger on the bird and trace a path to the tree. Say to the child, "Be sure to keep your finger on the board." Ask the class, "Did (name a child) cross the path?" (yes) Guide the children to say that "you have to cross a closed path when going from the inside to the outside" as you slide the felt tree from inside the path to outside the path.

Similarly, guide them to say, "You have to cross a closed path when going from the outside to the inside," as you slide the felt bird from the outside of a path to the inside of the path.

Let the children do pupil pages 8 and 9.

Activity 2: More practice in finding the inside and outside of paths

Objectives:

1. Given several examples of closed figures, children can find the inside and outside of a closed path and can conclude that objects have to cross a closed path when moving from the inside of a closed path to the outside or from the outside of a closed path to the inside.
2. Given an illustration of an open figure, children can conclude that objects can move freely in an open path and there is no inside and no outside.

Materials: strips of yarn -- individual flannel boards and felt pieces (six for each child)

Teaching Procedure:

Have the children form a circular figure with yarn. Ask them to put any one of their felt objects inside the figure and to respond individually to the question, "Where is the (name of felt object)?" Answers will vary depending on which object is being named since every child has different felt objects. Follow the same procedure and line of questioning when referring to felt objects outside the path. Next as you display a closed figure (circle) with objects inside and outside it, move felt objects inside the figure and then move felt objects outside it.

Lead the children to say as they watch you "that when a path is closed, objects have to cross the path." Use the same display and move the yarn so that the circular figure is open. Using the same felt objects, have individual children move the felt objects from "inside to outside" and from "outside to inside" of the open figure. Lead the children to say as they observe the movement of the felt objects "that when a path is open there is no inside or outside because objects can be moved about without crossing the path." Continue the activity as long as needed using other open paths and felt objects and involving as many children as possible.

Activity 3: (Optional) - More practice with paths

Objectives:

1. Children can make representations of closed and open paths and differentiate between the two.
2. Children can change the shape of a closed path into different forms and still keep the resulting path a closed one.
3. Children can change a closed path into an open path.

Materials: four ropes 12" in length or four long pieces of cord 12" in length, a roll of masking tape or scotch tape

Teaching Procedure:

Divide the class into four equal groups and give each group a length of rope (or cord). Ask each group to place the rope on the floor so that it represents a closed path. To make sure the ends stay together have them use masking tape on the ends. Then ask individual children in the groups the following questions: "Is this an open path or a closed

path?" (closed path) Have one child in each group represent the starting point in the path, then have the other children in the group verify that the path is closed because they can start at this point (where the child representing the starting point is standing), go along the path, and return to the starting point without having to turn around and move back along the path or crossing or touching a part of the path previously traced. Have the starting position moved, (ask another child in the group to represent the starting point and continue the questioning as before. Next, have the four groups join together so that two groups result. Then direct part of the children in one group to stand inside the closed path (represented by the rope) and the other part to stand outside the path. Have some of the children, one at a time, move from outside the path to inside then reverse the procedure (from inside to outside). Have the children in the second group observe that each child involved in the activity had to cross the closed path when moving from inside the path to outside the path and from outside the path to inside the path. Vary this activity by having the children change the shape of the path into different forms but keeping the resulting path a closed one.

For further practice ask the children to suggest how the path can be changed from a closed path to an open path. (We could separate the ends of the rope to show an open path.) Again select a child to represent the starting point on this path and have another child show that in an open path you cannot move from the starting point along the path and get back to the starting point without turning around and moving back along the same path (or retracing your steps on the path).

TOPIC VI: CLASSIFYING REGIONS

OBJECTIVES:

1. To recognize that a circular region, rectangular region, and a triangular region consists of the curve itself and its interior.
2. To identify circular, rectangular, triangular, and square regions.

VOCABULARY: *circular region, *rectangular region, *triangular region, *square region, inside, outside, on closed paths (curves)

*Note: The teacher may use these words as part of her vocabulary when talking about the different curves and their interiors but she should not expect her children to learn them as long as they can differentiate between the name of the curve and its interior.

MATERIALS: felt geometric forms, felt shapes of circles, rectangles, triangles, and squares, and felt objects; pupil pages 10 - 14

Activity 1: Reviewing the idea of the inside and the outside of simple geometric shapes

Objectives:

1. Given a collection of geometric shapes, children can demonstrate the inside and the outside of these shapes.
2. Given a collection of regions (circular, rectangular, triangular, and square) children can compare these with models of circles, rectangles, triangles, and squares.

Materials: felt geometric forms of circles, triangles, rectangles, squares, and the regions of the above mentioned curves, flannel board, felt objects (trees, birds, dots, balls, cats, etc.), and wire geometric models

Teaching Procedure:

Display on the flannel board the circular curve, the triangular curve, and the rectangular curve, and the square. Ask individual children to come up and trace the circular curve, the triangular curve, the rectangular curve, and the square. Next place the felt bird inside the circular figure. Ask, "Is the bird inside or outside the circle?" Then place a felt ball outside the circle. Ask, "Is the ball inside or outside the circle?" Continue reviewing inside and outside using the other curves on the flannel board.

Use the same display as above. Ask the children to choose a wire model of any of the geometric forms displayed on a table. Then have them find on the flannel board a region that would fit the shape of the wire model. Continue this procedure until all the wire models and the felt regions have been matched. Then have the children compare a square region with a circular wire form by fitting the circular wire form on the flannel square region. Follow the same procedure until all the wire forms and felt regions have been fitted and compared and these questions have been asked and answered:

Does the inside part of the circle fit the square figure? (No) Why not? (the region is round and the square is not round) (The square

has sides and corners.) Does the rectangular form fit the triangle? (No) The teacher may ask as many questions as she feels are necessary to clarify the comparison of regions and their curves.

At the conclusion of this activity children should be able to see and understand that the curve of the figure follows the contour of its interior.

Activity 2: Classifying circular regions, triangular regions, rectangular regions, with circles, triangles and rectangles respectively — Pupil pages 10 - 14

Objectives:

1. Given a collection of geometric figures, children can compare them to regions of these figures.
2. Given a collection of geometric shapes and regions, children can recognize similarities and differences in the figures and regions.

Materials: flannel board, felt regions, felt circles, triangles, rectangles, wire geometric models, pupil pages 10 - 14

Teaching Procedure:

On the flannel board place an assortment of regions of the types mentioned above. Compare these with models of circles, rectangles, triangles and squares.

Ask the children, "How is a circular figure like a circle? (They have the same shape. The edge of the felt figure is like the felt circle.

The inside of the felt figure is filled in.)" It is called a circular region. Its edge is a circle.

Continue with the other figures. Refer to their straight edges as sides. Use the terms triangular region, rectangular region, and square region.

Place the wire models on a table and separate them according to their shape. Ask individual children to go to the flannel board, remove a region and to compare it with a wire model. Next ask the class to name the region. Then ask a child to place the region in the proper classification. Continue this procedure until all the figures have been removed and classified.

For additional practice use pupil pages 10 - 14. Ask pupils to find the different geometric figures, then for the bottom half of the page, have the pupils color the regions you ask them to find.

UNIT 4

Addition and Subtraction

OBJECTIVES:

1. To extend addition and subtraction (numbers 10 - 18).
2. To introduce the reading of a number sentence involving addition and subtraction and to complete a number sentence by finding the number that makes it true.
3. To introduce the meaning of equality and inequality in a sentence involving addition and subtraction.
4. To review the solving of word problems involving addition and subtraction and to understand the relationship of word sentences and mathematical sentences.

BACKGROUND INFORMATION FOR TEACHERS:

See Background information in Unit 2.

Note: Additional word problems are provided at the end of this unit. They are provided as suggestions for any given lesson. The teacher should include these and other number stories according to the concepts taught and the daily experiences of the children.

TOPIC 1: ADDING ONES TO TEN, FOCUSING ON THE CONCEPT OF 11 - 14

OBJECTIVE: To review sets of ten and the concept of adding ones to ten.

VOCABULARY: eleven, twelve, thirteen, fourteen

MATERIALS: books for a set of ten and extra ones, 2 tagboard strips each divided into 10 squares (per child), markers, flannel board, pegboard and pegs, pupil pages 15 - 42

Teaching Procedure:

Activity 1: Relating addition and subtraction in a review of numbers with sums no greater than 10

Pupil pages 15 - 16

Objective:

Children can relate the idea of addition and subtraction with sums no greater than 10.

Materials:

Flannel board, pupil pages 15 - 16

Review the idea of addition and subtraction and relate four sentences to two sets and their union. The flannel board or other objects may be used. Record the number sentences on the board.

4 + 3 = 7

7 - 3 = 4

3 + 4 = 7

7 - 4 = 3

Use pupil pages 15 and 16 as a review of relating four sentences to two sets.

Activity 2: Concept of 11 - 19 as ten plus 1 - 9 ones

Pupil page 17

Objective:

Children can illustrate the idea of addition by adding "one more" to any given number less than ten and to ten.

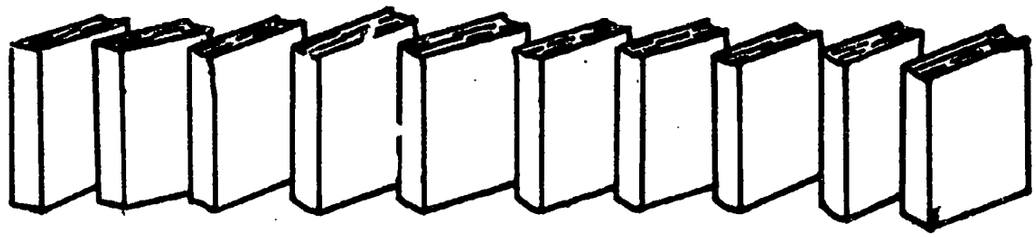
Materials:

Books for a set of 10 and beyond, pupil page 17

Concept of Eleven

Review the idea of adding "one more" to any given number less than ten. Start by placing one book on the table, have the other set of one book in hand. Join the two sets by placing the book in your hand on the table. Record on the board 1 + 1 = 2. Hold another book in your hand and identify the set of 2 and set of 1. Join the two sets as before. Record 2 + 1 = 3. Continue until 10 books are on the table

Ten Books



and the following is recorded on the board.

1 + 1 = 2

2 + 1 = 3

3 + 1 = 4

4 + 1 = 5

5 + 1 = 6

6 + 1 = 7

7 + 1 = 8

8 + 1 = 9

9 + 1 = 10

Ask the children how many books they will have if they add one more. (Eleven) Write the numeral 10 and remind the children that the 1 now stands for one ten (the set of 10 books). Direct one of the children to start a new pile placing one extra book next to the set of ten. Write the number sentence $10 + 1 = 11$

Tell the children that the numeral 11 is thought of as one ten and one one. Add another book and write the sentence $10 + 2 = 12$. Have the children explain the meaning of the numeral 12 as 1 ten and 2 ones. Do the same for $10 + 3 = 13$, $10 + 4 = 14$, etc. through 19. Do other similar activities until the children understand that the numeral 14, for example, is ten plus four; 18, ten plus 8, etc.

Concept of 12 - 19

On pupil page 17 the children will have the opportunity to review sums of ten and add tens and ones.

Activity 3: Using sets of ten for addition

Pupil pages 18 - 21

Objective:

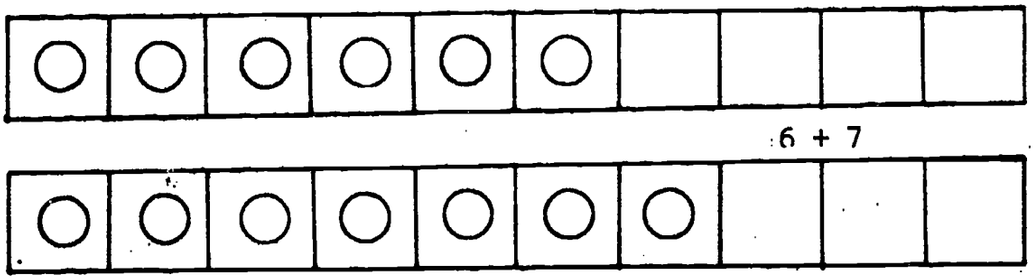
Using tagboard strips divided into ten squares, children can demonstrate using sets of ten for addition.

Materials:

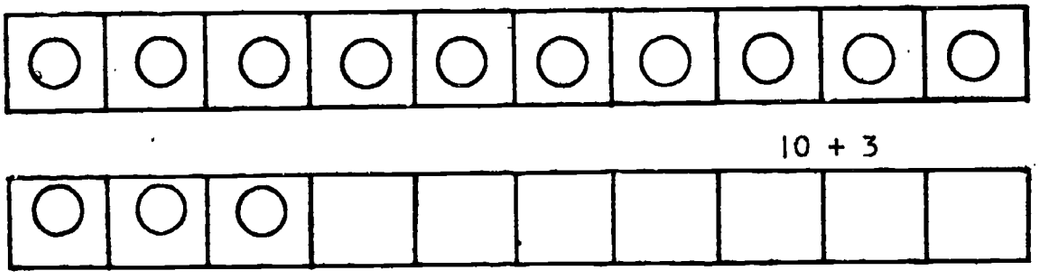
Two tagboard strips each divided into ten squares for each child, markers, pupil pages 18 - 21

Have children place six markers on the first six squares of the first strip. Then ask them to place seven markers on the

first seven squares of the second strip. Write 6 + 7 on the board. The childrens' strips should look like this:



Then say, "How many markers could you move to fill the squares in the first strip? (four) Move them." The strips will look like this:



So 6 + 7 = 10 + 3

10 + 3 = 13

6 + 7 = 13

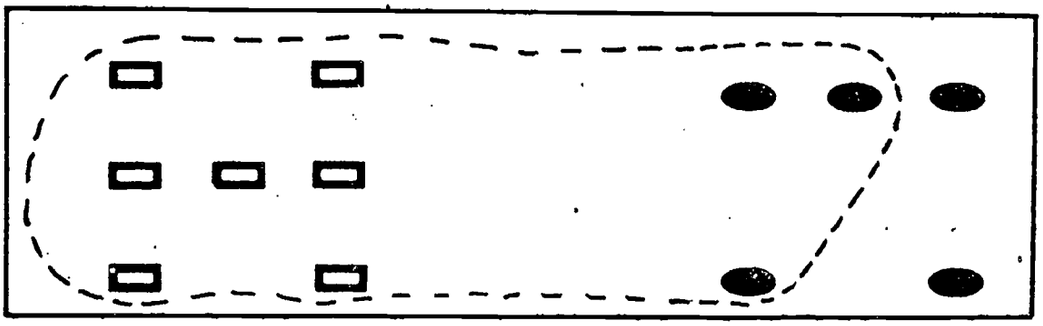
Follow this procedure with numbers 11 through 14. Help the children to sense that since we know that 10 + 3 = 13, we know that 6 + 7 = 13. Write a final sentence on the

board so that the following now appears:

$$6 + 7 = 10 + 3$$

$$6 + 7 = 13$$

Use several similar examples. In each case use a piece of yarn or string to show the formation of a set of 10, as



Along with this write:

$$7 + 5 = 10 + \underline{2}$$

$$7 + 5 = 12$$

Have children use sets of objects on their desks to find

$$9 + 4 = \_\_\_\_$$

$$6 + 7 = \_\_\_\_$$

$$8 + 5 = \_\_\_\_$$

On pupil pages 18 and 19 have children draw a ring around a set of 10, then fill the blanks to complete the sentence. Pages 20 and 21 may be done without the use of illustrations.

Activity 4: Further practice using sets of 10 for addition with sums to 14

Pupil pages 18 - 21

Objectives:

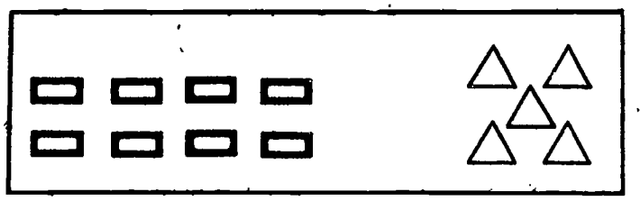
1. Using flannel objects and string, children can demonstrate the idea that sets of less than 10 objects are joined to form a set of 10 for addition with sums of 14.

2. Children can write on the board a number sentence to illustrate the joining of sets to form a set of 10 for addition with sums of 14.

Materials:

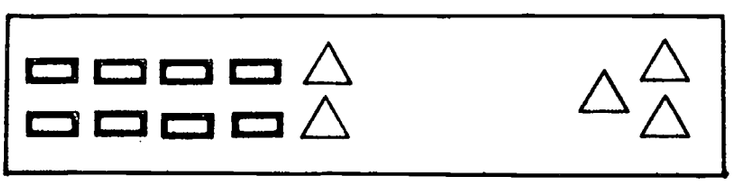
Objects for flannel board, yarn or string, sets of objects (blocks or discs), pupil pages 18 - 21

Display sets of 8 and 5 objects on the flannel board such as



Direct children's attention to the idea that forming a set of 10 may help us find how many objects would be in the new set if we were to join the set of 5 to the set of 8. Ask how many objects should be joined with the set of 8 to form a set of 10. (2) Show this on the flannel board, with the objects now arranged in this way.

Flannel Board



Write on the board

$$8 + 5 = 10 + \_\_\_$$

and have the children indicate how to complete the sentence correctly.

$$8 + 5 = 10 + 3$$

Activity 5: Reviewing the associative property of addition

Pupil page 22

Objective:

Children can write a number sentence to illustrate the associative property of addition.

Materials:

Pupil page 22

Use pupil page 22 to review the associative property of addition. Write 5 + 2 + 3 on the board. Say,

Associative Property

Let us think about the sum of these three numbers. How can we find the sum of these numbers? (Suppose they suggest adding 2 to 5) What would that give? (7) And then what would we do? (Add 3 to 7) What would we have then? (10)

We can write

$$5 + 2 + 3 = 7 + 3$$
$$= 10$$

When we want to add the 5 and 2 first how can we show this? Like this

$$(5 + 2) + 3$$

Is there another way of adding these three numbers without changing the order of the written numerals? Suppose we first add the 2 and the 3. What will this give? (5) Now we add this 5 to the 5 we already had and what sum do we get? (10)

So we can also write $5 + 2 + 3 = 5 + 5$
$$= 10$$

and we show it like this $5 + (2 + 3)$.

When working the remainder of page 22 discuss the operations with the children. The pupil page is provided for practice with addition.

Activity 6: Reviewing partitions of 10 | Pupil pages 23 - 26

Objective:

Children can use the process of partitioning in illustrating the separation of sets and their subsets in conjunction with the associative property of addition.

Materials:

Counting objects (blocks, discs), pupil pages 23 - 26

Reviewing Sets (10) and Their Subsets

Using objects on the flannel board and children using discs at their desks, arrange 11 objects as a set of 6 and a set of 5 (with the set of 5 to the right). Put felt numerals 6 and 5 under the sets.

Write:

6 + 5 =

Ask yourself, "What subset of the set of 5 can I remove from the set of 5 and join to the set of 6 so that I will have a set of 10?" Think: Six plus what number equals ten? (4) So we separate a set of 5 into a set of 4 and a set of 1.

Move one of the objects a little to the right and replace the 5 numeral with the symbols 4 + 1. Now move the set of 4 to the left to join the set of 6. Change the symbols 6 + 4 to the numeral 10.

Now we join the set of 1 to the set of 10. How many members has the union? (11) Replace the symbols 10 + 1 with the numeral 11. Explain as you write

6 + 5 = 6 + (4 + 1)	(4 + 1) is another name for 5
= (6 + 4) + 1	Associative property of addition
= 10 + 1	10 is another name for (6 + 4)
= 11	11 is another name for (10 + 1)

Pupil pages 23 - 26 provide further practice in partitioning and using the associative property.

Activity 7: Using 10 in subtraction

Pupil pages 27 - 30

Objective:

Using pegs and pegboards, children can illustrate three approaches in the use of ten in subtraction.

Materials:

Pegs and pegboards (for individual children), pupil pages 27 - 30

Note: Children may use several approaches to subtraction, three of which are suggested in this lesson. What is easiest for one child may be most difficult for another. Present all three methods and let each child decide which he will use. Yet do not do it in such a way as to be confusing. After studying the methods, decide to start with the one most appropriate for your class. Then adopt others to individual needs.

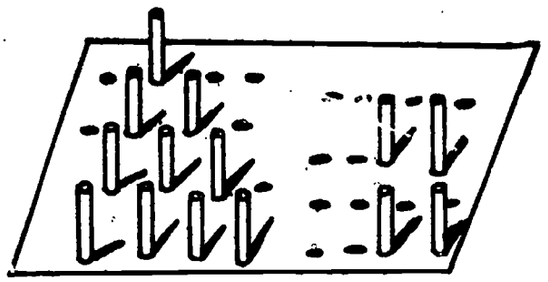
Using Ten In Subtraction

Suppose a child is given the problem 14 - 6 = ____. He may simply think of the inverse of a basic addition fact he knows: 6 + 8 = 14. Therefore, 14 - 6 = 8. If he worked with

a set of 14 objects, he would simply remove a set of 6 objects and identify the number of objects in the set remaining.

Identifying Sets With Ten

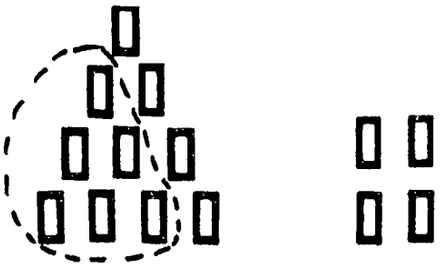
He may think of 14 as 10 + 4. He then subtracts 6 from 10 and adds 4 to the 4 ones of 14. This may be illustrated with a set of 14 objects. Place pegs in pegboard to show a set of 14 objects arranged as shown:



Have the number of the set identified, and write

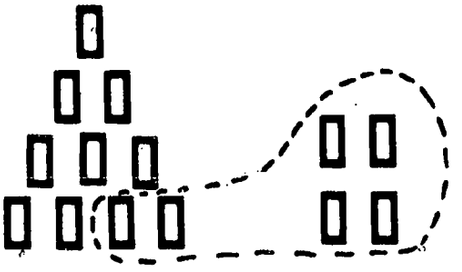
$$14 - 6 = \_\_\_\_$$

Ask a child to show how he would remove 6 pegs from the set of 14. The child may remove a set of 6 from the set of 10, move the 4 objects over to the remainder set, and think $10 - 6 = 4$ and $4 + 4 = 8$.



The child may think of first subtracting the 4 ones from 14, and then subtracting 2 from 10. On the pegboard, with a set of objects arranged as before, he would first remove the set

of 4, remove 2 more from the set of 10, and observe that the number of the remaining set is 8.



More Practice

Give several examples and have children use manipulative materials to solve them. Suggest that sets representing the first number be arranged on desks as sets of 10 and another set as indicated by the example. If children can solve the problems without use of manipulative materials, ask them to tell what they are thinking as they solve them.

On pupil pages 27 and 28 the children are to draw a ring around the set they think of removing. Children who need to use their knowledge of the partitions of 10 may continue to "find ten" for some time. Many children learn the "doubles" (6 + 6, 7 + 7) easily, and will find ways to use these in learning other facts. For instance, a child may think: 6 + 7 = 6 + 6 + 1, 6 + 6 = 12, so 6 + 7 = 13.

Pupil pages 29 and 30 provide practice with basic facts with sums of eleven through fourteen.

Activity 8: Finding missing addends on a number wheel and relating these to subtraction with numbers whose sum is 11 - 14

Pupil pages 31 - 32

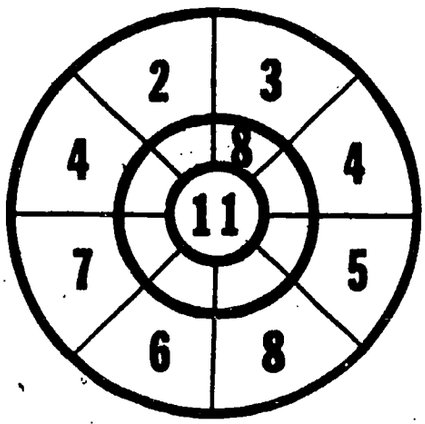
Objective:

Children can find missing addends on a number wheel and relate these to subtraction with numbers whose sum is 11 - 14.

Materials:

Pupil page 31 - 32

Put one or two number wheels like the one below on the board and let the children talk about them. You may call them "missing addend wheels".



The Number Wheel

Eleven is the sum on this wheel. Ask, as you point, "Three is one addend of 11. What is the other addend?" or "Three plus what number is equal to eleven." Let a child answer by writing a numeral in the space (shown by dotted line "8"). Write this as a sentence, 3 + ___ = 11. Let another child show this with counters. A child who makes an error can see that his answer does not make a true sentence. He can write another numeral on the wheel. Go on until the wheel is filled in.

After the wheel is completed, review each of the sentences. The children know there are many different numeral names for the number eleven. Guide them to say that "4 + 7", "9 + 2", "2 + 9", "5 + 6", "6 + 5", "8 + 3", and "3 + 8", are all numerals for eleven. Do the same for 12, 13, and 14.

Let the children complete the wheels on page 31. Ask them to show the missing addends by placing numeral cards in the blank spaces. When the wheels are complete, ask the children to complete the addition sentences on page 32 for the wheels on page 31. For example, the sentences shown on the top wheel are:

6 + 5 = 11	9 + 2 = 11	4 + 7 = 11	8 + 3 = 11
11 - 5 = 6	11 - 2 = 9	11 - 7 = 4	11 - 3 = 8
11 - 6 = 5	11 - 9 = 2	11 - 4 = 7	11 - 8 = 3

It is suggested that the teacher stop at this stage and go on to the following unit. After completing the new unit return to Activity 9 Unit 4.

Activity 9: Practice with sums of 14 or less

Pupil pages 33 - 42

Objective:

Children can add or subtract numbers with sums of 14 or less.

Materials:

Pupil pages 33 - 42

Use sets if needed as in previous activities to add and subtract numbers with sums of 14 or less. Have the children open their books to pupil pages 33 - 42. Have them work

many examples orally before writing the answers. Quick mental review of the number facts with sums 13 and 14 should be done before working these pages. Number stories should also be used as an added means of reinforcing the child's ability to relate the meaning of numbers, their sums and differences, to his daily experiences. (These pupil pages need not all be done in one class activity, but should be spread over a period of time, according to the pace at which the children are able to grasp the concepts.)

TOPIC II: ADDITION AND SUBTRACTION WITH NUMBERS 15 - 18

OBJECTIVE:

To review addition and subtraction with numbers 10 - 14 and to introduce numbers with sums beyond 14 and not greater than 18.

VOCABULARY: fifteen, sixteen, seventeen, eighteen

MATERIALS: coathanger balance; flannel board; peg and pegboard; overhead projector (if available); if possible, recording tapes; pupil pages 43 - 64

Teaching Procedure:

Activity 1: Addition with sums 15 - 18 — Pupil pages 43 - 50

Objective:

Children can discover relationships and from past experience draw new ideas about finding sums from 15 - 18.

Materials:

Pupil pages 43 - 50

Use any of the activities already given to help children discover relationships and from their past experience draw new ideas about finding sums from 15 - 18. Sets of paper cups or nut cups may be used for partitions of 10. Other suggestions are the coathanger balance, counting by tens and ones as in place value, flannel board grouping, grouping with pegs and pegboard, using the overhead projector, using tapes with recordings for quick mental work, etc. After children understand the basic concepts and different meaningful ways of arriving at the answer, the basic facts should be memorized. Ask the children to think of as many different possible pairs of numbers as they can which when added result in the sum of 15. Record these on the board

15 = 15 + 0	15 = 0 + 15
15 = 14 + 1	15 = 1 + 14
15 = 13 + 2	15 = 2 + 13
15 = 12 + 3	15 = 3 + 12
15 = 11 + 4	15 = 4 + 11
15 = 10 + 5	15 = 5 + 10
15 = 9 + 6	15 = 6 + 9
15 = 8 + 7	15 = 7 + 8

Give children time to study these mentally, then erase the addends and have children fill in the missing answers. Follow this same procedure for sums of 16, 17, and 18; then use pupil pages 43 - 50.

Activity 2: Reviewing addition and subtraction with sums less than 18

Pupil pages 51 - 55

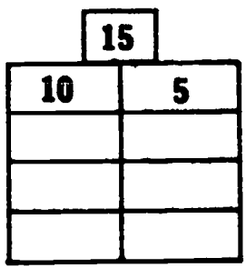
Objectives:

1. Given a numeral placed on a pocket chart, children can find a pair of numbers whose sum is that numeral.
2. Children can name several combinations for addition and subtraction with sums less than 18.

Materials:

Large numeral cards 15, 16, 17, 18, individual 1 inch numeral cards, pupil pages 51 - 55

Use the pocket chart holder to place a large numeral card with 15 written on it. Tie a string or piece of yarn to a paper clip and clip it to the chart under the numeral card.



Ask the children to use their numeral cards to find a pair of numbers whose sum is 15. When a child finds a correct pair of numerals let him place one of the cards on the left side of the string and one on the right side as shown above. After this is done, and the board is filled with different combinations, clear the board, and try the same procedure with the large numeral cards 16, 17, and 18. Subtraction facts may be reviewed in this way by starting with the given numeral on top, and saying 15 - 10 = 5 or 15 - 5 = 10, etc.

Pupil page 51 may be used to extend this activity. The children are to write the correct numeral in the box after they have decided which numbers when added would result in the given sum. The addition table on pupil page 52 may be used for further practice with sums of 10 - 18. Pupil pages 53 - 55 provide extra practice with addition and subtraction.

Activity 3: Addition with sums 18 or less

Pupil pages 56 - 60

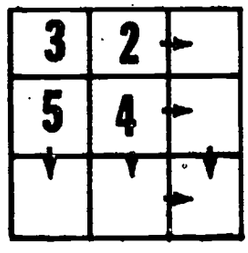
Objectives:

1. Children can use puzzles with 1 inch square numeral cards in working with addition with sums 18 or less.
2. Children can demonstrate that the commutative and associative properties of addition are applied in working with number puzzles.

Materials:

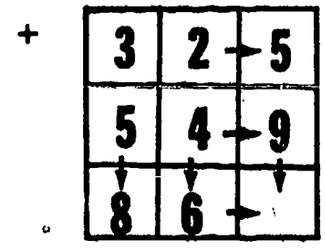
1 inch square numeral cards, pupil pages 56 - 60

Put a chart like this on the board: +



Puzzles Say, "The signs tell us to add. Some of the addends are in a column. What numbers go in the boxes?" Let the children talk about this. Cover with your hand or paper all numerals except those two addends with which you are working to keep from confusing the children. You say, "3 + 2 = 5. I will put 5 in this box." Write "5" in the top box. Ask a child to write a numeral that he thinks should go in another box.

He can add 3 and 5, 2 and 4, or 5 and 4. If he puts a "9" in the chart, get him to say, "5 + 4 = 9. A 9 goes in the chart here." Go on until the chart looks like this:



Finally, the last box can be filled by adding either 5 and 9 or 8 and 6. The children find that whichever pair they choose to add, the sum is 14.

Put several other charts like this on the board for the children to fill in. The children find that to put a number in the last box they can either add "across" or "down". Let them talk about why this is true.

Further Explanation of Puzzles

(Note that in each case we have found the sum of the same four addends. The commutative and associative properties of addition which have been introduced previously apply here in that changing the order and grouping of the four addends does not alter their sum. Children should not be forced to verbalize their ideas, but should not be discouraged from any discoveries they can make along this line.)

Let the children find page 56 in their books. Ask them to fill in the boxes. Encourage them to cover all numerals except the two addends with which they are working. Each empty box may be filled by placing a numeral card on the box. (Since the same numeral must be used in several places, give each

child some blank, one-inch square cards. As he needs a numeral, he can take a card, write the numeral on it, and place it on the proper box.) Pupil pages 57 - 59 may be used for reinforcement. Pupil page 60 is optional. It may be used by more able students.

Activity 4: Subtraction game (smaller groups)

Objectives:

1. Using 3-inch square cards with patterns of squares in rows of five or fewer and a cardboard, children can demonstrate the idea of subtraction covering a number of squares with the cardboard and finding the number left uncovered and subtracting this number from the total number.
2. Children can demonstrate the idea of subtracting facts with addition sums of 10 - 18 using 3-inch square cards with patterns of squares in rows of five or fewer and a cardboard by covering a number of squares with the cardboard and finding the number left uncovered and subtracting this number from the total number.

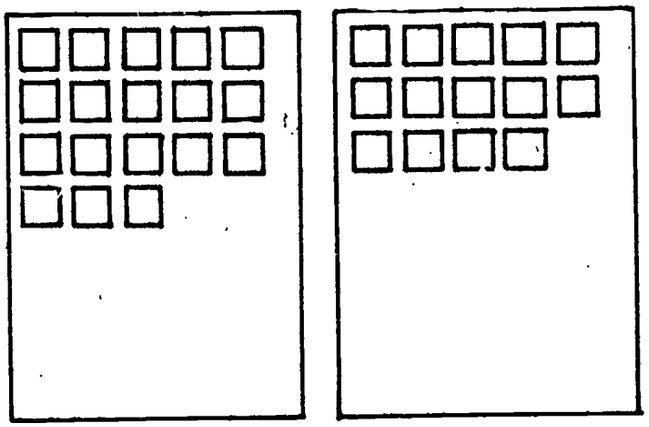
Materials:

Eleven square pieces of cardboard, three inches square and eleven pieces of cardboard described below.

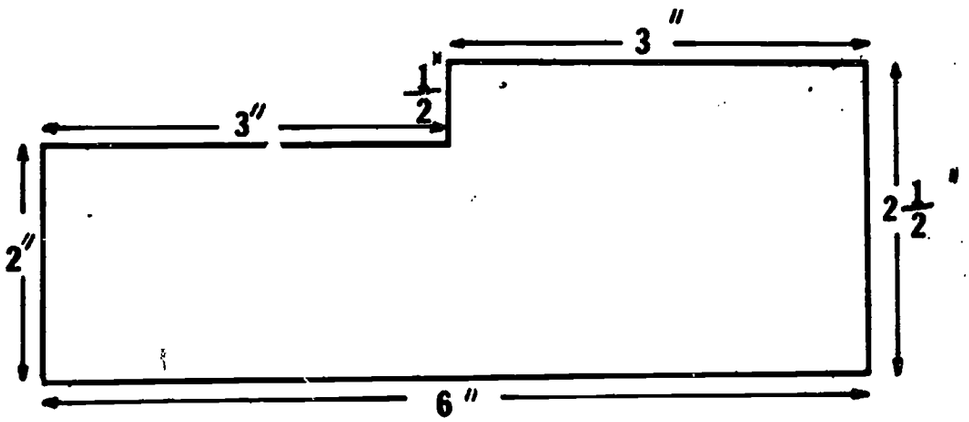
Subtraction Game

For this activity you will need eleven 3-inch square cards with patterns of squares as shown below. Make squares in rows of five or fewer. The number of squares should be different on each card, with totals from ten to eighteen. For example,

the pattern of 18 and the pattern of 14 will look like this:



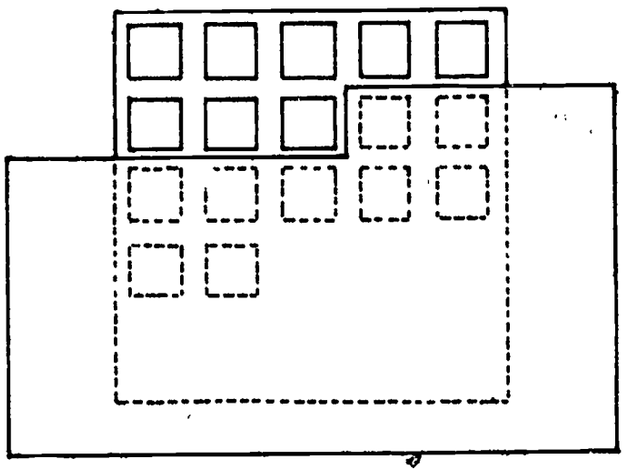
Then cut 11 pieces of cardboard in the following dimensions:



Two children at a time can use a pattern card and cardboard. Four to six children may work in one group with two children playing the game in turns, or this can be done with whole class.

First, the two children playing decide upon the total number of squares on the card. Let us suppose that they agree that there are 17 squares. They both write "17" on a sheet of paper. One child covers a number of the squares with the cardboard while the other closes his eyes. The second child then opens his eyes and decides upon the number of squares he

thinks are covered. He does so by finding the number left uncovered and subtracting this number from the total number. (17 in this example.)



In the sketch above, the child finds eight squares uncovered. He may subtract 8 from 17 and answer "9" immediately. If he finds it helpful he may write on a sheet of paper either the sentence

$17 - 8 = \square$ or $17 = 8 + \square$

After the answer is given, the first child removes the cardboard and the answer is checked. If the child has answered correctly, then it is his turn to cover the card. Another child can enter the game and try to tell the number of squares covered on another card.

Any number of squares may be covered including all or none of the squares. Continue the activity as needed to practice subtraction facts with addition sums of 10 - 18.

Activity 5: Subtraction sentences

Pupil pages 61 - 62

Objective:

Using a subtraction wheel, children can find the missing number that will make the subtraction sentence true.

Materials:

Pupil pages 61 and 62

Ask the children to find page 61. Let them talk about the wheel they find on the page. There are eight subtraction examples represented on the wheel. For each the number ten is needed to make the sentence true.

Ask the children to look at each of the sections of the wheel in turn. Read one of the sentences with the children, for example, 11 - 1 = 10. Say that we begin with the number named on the outer ring and subtract from it the number named on the inner ring. For example, subtract one from eleven, two from twelve, and so on.

As the children think about each sentence, they find that the number needed to make a true sentence is ten. When they have agreed that ten is the missing number in every case, they place a 10-card on the center of the wheel.

Then let the children complete all the sentences at the bottom of the page correctly. They place a numeral card in each box. On pupil page 62 they are to make the sentence true.

Activity 6: Subtraction in vertical form

Pupil pages 63 - 65

Objectives:

1. Children can demonstrate the idea of the concept of subtraction in writing subtraction sentences in horizontal form and in vertical form.
2. Children can show the idea of the concept of subtraction in vertical form using the square pattern cards with ten squares and proceed as in Activity 4.

Materials:

Pieces of cardboard to be used by teacher for covering on the board the number of squares to be subtracted, pupil pages 63 - 65

Write a subtraction sentence on the board and then show the same subtraction in vertical form.

Subtraction Vertical Form

$17 - 8 = \square$

$$\begin{array}{r} 17 \\ -\ 8 \\ \hline \square \end{array}$$

Say, as you point, "Both of these say the same thing." Ask a child to complete both exercises so that the sentence is true. Let him read the sentence. Both examples may be read "Seventeen minus eight equals nine."

Point out that we may also think of the examples as saying that the number added to eight to get seventeen is the number nine. Let the children give several other examples showing subtraction in both forms.

Then put a number of exercises such as the following on the board.

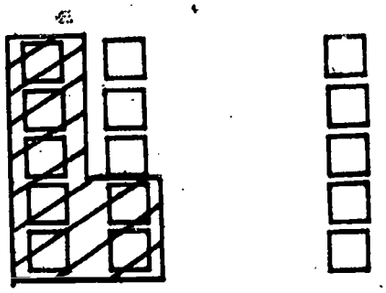
$$\begin{array}{rrrrrrrr} 15 & 15 & 14 & 11 & 13 & 16 & 17 & 18 \\ -\ 7 & -\ 9 & -\ 8 & -\ 6 & -\ 8 & -\ 4 & -\ 3 & -\ 6 \end{array}$$

Say, as you point to the first exercise, "We wish to subtract seven from fifteen. Let us make a picture of fifteen things on the board." Point to the numeral "15" and say, "How many tens are there? (1) We will draw one set of ten things on the board. How many ones? (5) We draw five more things."

Draw fifteen squares in this pattern, with ten squares separated from the five squares.

$$15 = 10 + 5$$

"What number is subtracted?" (7) Cover seven of the group of ten squares with a piece of cardboard.



Say, "Now let us find the number of squares left uncovered. We subtracted 7 from the ten. How many are left on this side?" (3) "How many all together?" (8)

Let a child make the first sentence true by writing "8" on the board. Use the same plan for the other exercises.

The purpose of this method is to help the children see that $15 - 7 = \square$ may be expressed as $(10 - 7) + 5 = \square$ or as $3 + 5 = \square$. Do not write these sentences but help the children to see that we subtract seven from ten to get three and then add the remaining five.

Let the children do pupil pages 63 and 64. On page 65 let them complete the subtraction.

Activity 7: Equalities and inequalities using a comparison of two sets

Pupil pages 66 - 70

Objective:

Children can compare the sum of two numbers with the sum of two other numbers, and decide which sign <, >, or = should be chosen.

Materials:

Pupil pages 66 - 70

In working with equalities and inequalities when the sum of two numbers is to be compared with the sum of two other numbers a series of steps should precede a final comparison, since such a comparison may be difficult at this age level. For example, in trying to find whether 5 + 7 is less than, greater than, or equal to 6 + 5 ask the children if they can give the sum of 5 + 7. Record on the board

5 + 7 = 12

Then ask if they can give the sum of 6 + 5. Write this sentence on the board.

6 + 5 = 11

Finally, write 5 + 7 ____ 6 + 5.

By looking at the sums of the sentences above, have the children decide which sign <, >, or = should be chosen for the correct answer. Then work pupil pages 66 - 70 with them.

Activity 8: Further practice with equalities and inequalities

Pupil pages 71 - 77

Objective:

Children can solve number sentences involving equalities and inequalities by indicating the sum of the two numbers in writing above or below the sentence.

Materials:

Pupil pages 71 - 77

Another simple step that children may prefer at this time in solving equalities and inequalities is simply to indicate the sum of the two numbers by writing the sum above or below the sentence as indicated in this example.

$$\underset{(2)}{10 - 8} < \underset{(8)}{10 - 2}$$

Write several of these examples on the board and then let the children work pupil pages 71 - 76. Page 77 may be used for practice with the basic facts 0 - 18.

It may be beneficial to make an enlarged addition table 0 - 18 and hang it on the wall so that it may be visible to each student. If they refer to the table often, it may help them memorize the addition and subtraction facts.

For enrichment it is suggested that a page similar to pupil page 77 be made but with the exception that the numerals be in reverse order along the top. The addition

table should look like this:

+	9	8	7	6	5	4	3	2	1	0
0	9	8	7	6	5	4	3	2	1	0
1	10	9	8	7	6	5	4	3	2	1
2	11	10	9	8	7	6	5	4	3	2
3	12	11	10	9	8	7	6	5	4	3
4	13	12	11	10	9	8	7	6	5	4
5	14	13	12	11	10	9	8	7	6	5
6	15	14	13	12	11	10	9	8	7	6
7	16	15	14	13	12	11	10	9	8	7
8	17	16	15	14	13	12	11	10	9	8
9	18	17	16	15	14	13	12	11	10	9

Activity 9: Related addition and subtraction sentences

Objectives:

1. Children can use objects to illustrate related addition and subtraction sentences.
2. Children can use the separation of sets into subsets to relate the idea of the concept of addition to the concept of subtraction.

Materials:

18 blocks or counters for each child

Separating Sets

Give each child 18 blocks or counters. Ask the children to form a set of 18 blocks. Then ask them to take 7 of the blocks and place them to one side on their desks. Say, "We have separated the set of 18 into two subsets. We have used

7 of the blocks to form a subset. Without counting, can you tell me the number of blocks in the other subset?"

After an answer has been given, say, "We can check the answer by writing a number sentence on the board. If we put all the blocks together again, how many will we have? (18) We put a subset of 7 blocks with the other subset and we have 18 blocks."

Get some pupils to look at the set and to write the sentence about them. They will write,

$18 = 7 + \square$ $\square + 7 = 18$

Ask a child to make the sentences true. (Point out that the order of adding numbers does not change the sum. This means that these two sentences are true for the same number.) When the child has written a numeral in the boxes ask the children to count the members of the other subset they have to see if the sentences are true.

Ask, "Can someone write a subtraction sentence about your sets?" A child should write

$18 - 11 = 7$ or $18 - 7 = 11$

Ask the child to read the sentence to the class. (Example: Eighteen minus seven equals eleven.)

Let the children talk about what the sentence means. (If we have a set of 18 things and separate a subset of 7 things from the set there is also a subset of 11 things left.) Ask, "If we have some things and put a set of 7 with it so as

Subtraction Sentences

to have 18, what should be the number of the first set?" Point to the addition sentence, $\square + 7 = 18$, and ask, "What subtraction sentence asks the same question?" When a child answers, write the sentence $18 - 7 = \square$ under the sentence $\square + 7 = 18$. Ask the children to look at the other addition sentence, $7 + \square = 18$. Ask for a subtraction sentence to match this. Try to get the reply, $18 - \square = 7$, and write it under $7 + \square = 18$. Get someone to tell what this sentence asks. (It asks what number must be added to 7 to get 18?) (To "undo" adding, we subtract.)

Activity 10: Subtracting by finding the missing addend with sums to 18

Pupil pages 78 - 80

Objective:

Children can subtract by finding the missing addend with sums to 18 through the use of unit marked strips of tagboard of different lengths and fitting smaller unit marked strips of tagboard of different lengths over them.

Materials:

Pupil pages 78 - 80

Strips of cardboard of different lengths that are marked with numerals 1 - 18. The 1-strip may be on any length but the 2-strip must be twice that length, the 3-strip three times that length, and so on, and the units indicated. Those longer than 10 units should have a heavy mark for every 10 units, for example,

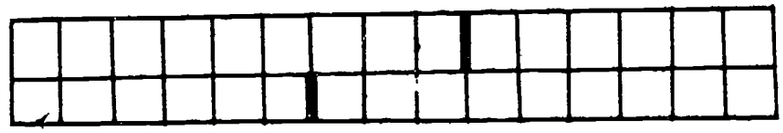
Further Practice

Let children show some subtraction exercises with the strips. For example, put the following sentence on the board:

$$15 - 6 =$$

Put the 15-strip on the table. Then ask a child what number the sentence told us to subtract. (6) Let another child select the 6-strip and place it along the 15-strip in this way.

Ask another child to find the strip needed to add to the 6-strip so that the whole bottom strip is as long as the 15 strip. To complete the exercise he should choose the 9-strip. By placing it properly the child sees whether or not his answer is correct. The strip will fit only if he chooses the correct numbered strip as shown below



When the child is satisfied that the 9-strip is the correct choice, let him go to the board and write the numeral in the box. Continue with other examples of the same type.

Review addition and subtraction, by giving one or two examples at the board. For example, write

$$9 = 5 + \square$$

Ask a child to complete the sentence to make it true. Then write

$$9 - \square = 5$$

Say, "We know the same things in each of these sentences. We know the sum, 9, and one addend, 5. We are to find the other addend." Let another child complete the second sentence to make it true. Ask the children to read each sentence. (Nine equals five plus four. Nine minus four equals five. Let the children talk about the sentences.) Using two sentences this way is intended to develop an understanding for those comparative situations which are solved by subtraction in answering the questions. "How many more? How many less?"

Missing Addend

Write several subtraction sentences on the board, such as

$14 - 10 = \square$ $\quad 16 - 3 = \square$ $\quad 14 - \square = 9$

$17 - 14 = \square$ $\quad 15 - 13 = \square$ $\quad \square - 7 = 3$

Ask the children to write under each the related addition sentence. For example

$14 - 10 = \square$ $\quad \square + 10 = \_\_$

$16 - 3 = \square$ $\quad \square + 3 = 16$

$14 - \square = 9$ $\quad 9 + \square = 14$

$17 - 14 = \square$ $\quad \square + 14 = 17$

$15 - 13 = \square$ $\quad \square + 13 = \_\_$

$\square - 7 = 3$ $\quad 3 + 7 = \square$

Let the children discuss each pair of related sentences. Keep talking about the meaning of "-". For example, 14 - 10 means that one addend of 14 is 10 and we are to find the missing addend. Then, for example, the sentence $14 - \square = 9$ says that one addend of 14 is unknown and the other addend is 9. The children should then see that the sentence may also be written as $9 + \square = 14$. Let the pupils make all the sentences true. They may use counters if necessary to help

Addend

them in completing a sentence or to check their work. Let the children complete pupil pages 78 - 80 for added practice in making true sentences.

Activity 11: Addition and subtraction using the number line

Pupil pages 81 - 84

Objective:

Children can illustrate addition and subtraction number sentences on a number line.

Materials:

Number line on the floor or board, pupil pages 81 - 84

Number Line (Floor)

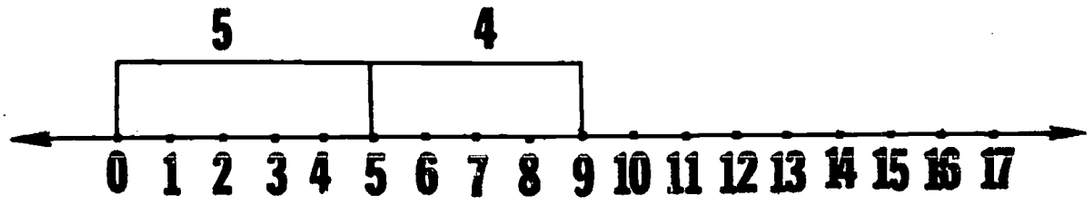
Make a number line on the floor. Put in points numbered from 0 - 18. Put in a few of the numerals, say 5, 12, and 15, then ask different children to fill in the others.

Write a sentence on the board:

$$5 + \square = 9$$

Say, "We may think of this sentence as asking us, 'What number added to five gives nine?' We must find the missing addend. To find the missing addend we will use the number line in this way." To show 5 have a child move along the line starting at 0. For example, if you call on Mary, you can say, "Mary is going to move along the line. What mark must she stop on? (5) How many spaces does she move in her first trip?" (5) "She is at 5; how many more spaces must she go to get to 9?" As

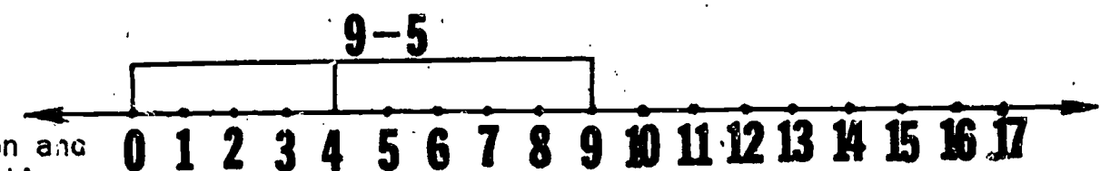
you and the pupils talk Mary should make trips on the line like this.



Ask Mary to make the sentence true by writing "4" in the box.

Say, "We can also show subtraction by using a number line. For example, let us put the sentence "9 - 5 = ☐, on the board. Say, "We first move 9 spaces. Then we subtract what number? (5) So how many spaces do we move back? (5) What mark are we on? (4) What number is 9 - 5?" (4)

Showing Addition and Subtraction On the Number line



Let the children talk about the ways of showing addition and subtraction on the line. They may say, "If we move 9 spaces, then move five in the other direction, we end on the 4 mark." (9 - 5 = 4) "We also see that if we first move 4 spaces, then five more, we end on the 9 mark." (4 + 5 = 9)

Let the children show subtraction sentences on the number line on page 81 of the workbook. Or put the same sentence, "9 - 5 = ☐", on the board. Ask another child to "jump" to 9.

Ask him how many spaces to "jump" back on the floor number line to make this sentence true (5).

Pupil pages 81 - 84 provide practice with addition and subtraction using the number line.

TOPIC III: USING LETTERS TO NAME NUMBERS IN ADDITION SENTENCES

OBJECTIVE:

To teach an understanding of the use of a letter name to designate the unknown number in addition sentences.

MATERIALS: 5" by 7" numeral cards (0 - 9); one-inch square cards with letters a, b, y, m, and n written on them; pupil pages 85 - 90

Teaching Procedure:

Activity 1: Using letters to name numbers

Objective:

Children can use a letter name to designate the unknown number in addition sentences.

Materials:

Large letter cards (a, m, y, n, b)

Review the use of open sentences. Write these on the board:

$4 + \square = 8$ $\quad\quad$ $6 + 3 = \square$

Ask the children to make the sentences true.

Open Sentences

Say, "We are going to play a game. I will think of a number. I will not tell its name. You will call it n. You are to find the number I am thinking about. I will help you by writing an open sentence on the board. The sentence will help you tell what the number n is."

Ask the children to close their eyes. You write this sentence on the board.

$$7 + 6 = 13$$

Cover the "6" with a card on which is written the letter n. Let the children open their eyes to see this:

$$7 + n = 13$$

Say, "Want a true sentence. Read the sentence. What number is n?" When the children give an answer, remove the card so that the children see the "6" that was covered. Ask, "What number is n in this sentence?" (6) Write the sentence

$$n = 6$$

Go on, "I am thinking of another number, and I will call it a. Go through the same plan as with the other sentence. Write a true sentence. Cover a number in the sentence with an a-card. Ask the children to look at it.

$$a + 10 = 10$$

Ask the children to read the sentence. Let them say what number a is. Remove the card and show "0". Say, "a is zero."

Letters To Name Numbers

Write this under the sentence.

$$a = 0$$

Go on with the game. Use other letters of the alphabet for numbers in the sentences. Do no use the same letter to

name different numbers.

Write these sentences on the board:

7 + y = 14	3 + 2 = m + 0	c + 7 = 14
y = ___	m = ___	c = ___
6 + 4 = z	9 + 1 = 5 + d	b + 0 = 13
z = ___	d = ___	b = ___

Let the children tell what number the letter in each sentence names. Let them check their answers. Ask them to erase the letter and write a numeral. Ask them to read the sentence. Let the other pupils say whether it is true.

For example, in the first sentence a child says that y is 7. Say, "Let us check to see if y is 7." Let another child erase the letter "y" and write "7" in its place. Let a child read the sentence. Ask, "Is the sentence 7 + 7 = 14 true? (Yes) It is true that y = 7? (Yes)" Go on with the other sentences.

Activity 2: Puzzle sentences

Pupil pages 85 - 87

Objective:

Children can use a puzzle sentence game to find the unknown number designated by a letter.

Materials:

Pupil pages 85 - 87

Tell the following story to help the children use page 85. Let the children have their mathematics books closed on

their desks. Tell the story this way:

"Once there was a little spider who lived in (say the name of your town.) He was really not a bad little spider but he loved to play tricks on people and especially on children.

Puzzle Sentences

"One day he was passing a school. It was the (use the name of your school) school. He looked in a window and he saw the children working with number sentences.

"'Well,' he said to himself, 'those children seem to know a great deal about numbers. See how easily they read the sentences. We'll see about that. I shall have to play a little trick on them. I shall fix those sentences so the children cannot read the numbers.'

"So he got some paint and some paint brushes, and after the children had gone he sneaked into the classroom, opened all the children's books, and went to work with paint and brushes. He painted very, very fast because, of course, like all spiders he had eight legs and he could hold a brush in each one.

"Open your books to page 85. You see what Mr. Spider's trick was. He has painted a letter over one of the numerals in each of the true sentences.

"He does not know it, but you can tell what the numbers are. You play a trick on Mr. Spider. Read the sentences and write the numeral Mr. Spider painted over.

"We will do the first sentence together. Look at the sentence 12 + m = 18. We know that m is a number. What is

it? (6) Write 'm = 6' under the sentence in your books. Continue with the other sentences on the page then do page 86 in the same way. You will fool Mr. Spider. Remember to make all the sentences true."

Open Sentences

Let the children tell what number n is in each sentence on page 87. Ask them to place a numeral card on the box in each exercise.

Activity 3: Letters used to name numbers in subtraction sentences

Pupil page 88

Objectives:

1. Children can use letters to name numbers in subtraction sentences.
2. Children can use different letters to demonstrate that the same letter is not always used to designate the unknown number.
3. Children can illustrate that one letter may stand for different numbers in different sentences.

Materials:

Pupil page 88

Write this sentence on the board:

$$15 - 10 = n$$

Letters To Name Numbers

"What number is n in this sentence?" When someone suggests a number, erase the n and replace it with the number suggested. Ask, "Is the sentence true?" If the answer is 5, say, "We

know that if n is 5 the sentence is true." Write this sentence on the board

n is 5

Tell the children to use their number cards to make sentences true. For example write this sentence on the board 6 = 12 - 6. Cover the last numeral (6) with a letter card (m) 6 = 12 - m. Say, "What is m?" Remove the letter card to let the children see that m is 6.

Give other similar examples and let the children take turns at writing true sentences covering a numeral with a letter-card and having other children tell what number the letter stands for to make the sentence true.

Use different letters so that the children understand that we do not always use the same letter. They should also understand that one letter may stand for different numbers in different sentences.

Have the children make the sentences true on pupil page 88.

Activity 4: Addition and subtraction sentences Pupil page 89

Objective:

Children can use letters to name numbers in comparing pairs of addition and subtraction sentences and read the appropriate symbols "=, +, -" that will make the sentences true.

Materials:

Pupil page 89

The sentences on page 89 use letters to name numbers. Some are subtraction sentences and some are addition sentences.

Write examples like these on the board:

$3 + 5 = 10 - n$ $\qquad$ $7 + 8 = 9 + y$

$4 + 6 = 12 - x$ $\qquad$ $9 + 3 = 15 - m$

Ask the children to tell what numbers the letter n could stand for to make the sentence true. Remind them that this symbol "=" means that '3 + 5' is the same number named by '10 - n'.

Follow same procedure with the other examples.

Get the children to read each symbol carefully. Tell them that in some sentences there is a "+" and in others there is a "-".

Let the children find page 89. Ask them to write numerals in the boxes to make the sentences true.

Activity 5: Making sentences true

Pupil page 90

Objective:

Children can make a sentence true when two numbers are designated by letter names and their sum is known.

Materials:

Pupil page 90

Further Practice

In the sentences there are two numbers named by letters. You are told one of the numbers and you are to find the other.

Write these sentences on the board:

$m + n = 8$

m is 5

n is $\square$

Ask a child to read the first sentence. Say, "We know that m and n stand for numbers. What number is their sum?" (8) "We are told what m is. What number is m?" (5) "If we erase the m in the sentence we could write the numeral 5." Write the numeral 5 in place of m. The sentence now is 5 + n = 8. Ask, "What number is n?" (3) Let the child who answers write the numeral in the box.

Do some other addition sentences and some subtraction sentences. Then let the children complete sentences to make them true. Assign page 90.

Activity 6: Writing a story for a number sentence

Objectives:

1. Given written number sentences, children can tell related number stories.
2. Given the number stories, children can write the related number sentences.

Materials:

Markers if needed

Write the number sentence below on the board as you say, "This number sentence tells some stories. I know one it tells."

5 + 2 = n

Say, "One story it tells is this: There were 5 children playing a game. Two children joined them. How many children were playing?" Let the children talk about the two stories, the one you told and the one told by the number sentence.

Number Sentences

Say, "This sentence also tells this story: Five books were on a table. Tom put 2 more books on the table. How many books are on the table?" Let the children talk about this story and that told by 5 + 2 = n.

Let the children tell other stories for the sentence 5 + 2 = n. Get them to say that a number sentence may tell many stories.

Write the sentence below on the board. Ask, "Do you know a story this sentence tells?"

5 - 2 = b

Give each child time to think of a story. Then let the pupils tell their stories. Let them talk about each story. Let them say whether the child's story tells or does not tell the same story as that told by the number sentence. Let the child change his story if it does not tell the same number story. Stories they may tell are these: There were five birds in the tree. Two birds went away. How many birds are in the tree?" or "Mary had 5 bananas. She ate 2 bananas. She gave Susan the others. How many did Susan get?" Tell number stories for these number sentences:

6 + n = 11 5 - b = 2 4 + 5 + m = 10

TOPIC IV: WORD PROBLEMS AND INEQUALITIES

OBJECTIVE:

To increase understanding through the use of word problems and inequalities.

MATERIALS: markers, if needed; pupil pages 91 - 92.

Teaching Procedure:

Activity 1: Word sentences and their number sentences

Objectives:

1. Children can relate a number sentence to a word sentence by demonstrating this relation with markers.
2. Children can read story problems and answer the questions asked in each problem.
3. Children can write a number sentence for a word problem.

Materials:

Markers

The purpose of this activity is to let children relate a number sentence to a word sentence. They first read a problem. They answer the question asked in the problem. They write a number sentence for the problem.

Read the sentences below to the children. Let them answer the question asked in each problem after it is read. They may use markers.

Word Sentences

1. In the classroom there are ten boys and six girls. There is a teacher in the classroom too. How many people are there altogether?

2. In a baseball game, Peter's team scored 9 runs. The other team scored 7 runs. How many runs were scored in the game altogether? Which team won the game? How many more runs did the winning team score than the losing team?

Go back to each problem and help the children write a number sentence which tells the story of the problem.

Problem 1: Read the problem again. Say, "I want to write this story with numbers. Will you help me? The story says there were 10 boys, 6 girls, and 1 teacher. The story asks how many people there were altogether. We will call that number c. There are three sets. Put together they make another set." As they say the number in each set write the numbers on the board like this:

10 6 1 c

Say, "We joined the three sets to make another set. What do we do with the numbers 10, 6, and 1? (Add them) Write "+" between the numerals on the board. Ask as you point to the writing on the board. "How can I make a sentence from this? What do you know about 10 + 6 + 1 and c?" (They are equal.) Write "=" to make a sentence. Say, "We have written a number sentence which tells the same story as the problem."

Let one child tell the problem. Let another child read the number sentence. Let the children talk about the problem and the number sentence and say, "They tell the same story."

Ask, "What number is c? (17) Write "17 = c" on the board. The board looks like this:

10 + 6 + 1 = c

17 = c

The other problem can be talked about in the same way. Let the children write on the board the numbers in the sentence.

Ask the children to try to make a number sentence. Let them talk about the relation of the story in the problem and the story in the number sentence.

Use the problem below in the same way. Be sure the children know the story of the problem. Let them tell what numbers are in the story. Let them tell how these numbers are thought about in the story. From this, let them write a number sentence.

1. Robert and Paul went into the country to pick berries. Robert picked ten berries. Paul picked two more berries than Robert picked. How many berries did Paul pick? (12)

2. John's team won three races in the morning and three races in the afternoon. Paul's team won four races in the morning. At the end of the day Paul's team had won the same number of races as John's team. How many races did Paul's team win in the afternoon? (2)

Activity 7: Making sentences true with "=" or "≠" Pupil pages 91 - 92

Objectives:

1. Given an open sentence, children can use trial and error to decide which numeral makes a sentence true.

2. Given several examples of open sentences, children can decide which symbols "= or ≠" to use to make the sentence true, and use the number line to show the sentence <u>is</u> true.

3. Children can demonstrate on the board that in "≠" exercises, many different numbers make the sentence true.

<u>Materials</u>:

Pupil pages 91 - 92

Put the open sentence below on the board. Ask the children what numeral goes in the box to make the sentences true. (14) Let a child write 14 in the box.

$$4 + 10 = \boxed{14}$$

Say, as you point to the "14", "The number 14 makes the sentence true. Can you think of any other number that makes the sentence true? A child may suggest a number, say 15. If no one says another number, you say a number. "Let us see if 15 makes the sentences true."

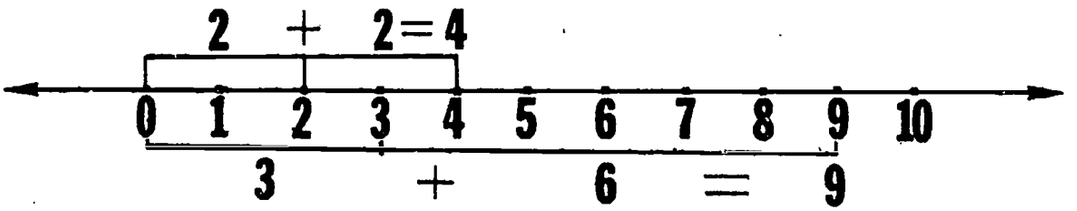
Erase the "14" in the box and put "15" in its place. Ask, "Is the sentence true now?" (No) Make a line through the "=" to make it "≠". Say, "Now the sentence says that 4 + 10 is <u>not equal</u> to 15. I have made the new sentence true. It is true that 4 + 10 does not equal 15."

Put several sentences on the board in which the sign (either = or ≠) is needed to make the sentences true. For example,

6 + 4 __ 10	4 + 2 __ 5	6 + 3 __ 9
2 + 2 __ 3 + 6	8 + 6 __ 14	5 + 6 __ 12
3 + 1 __ 8	2 + 2 __ 3 + 1	6 + 5 __ 10

Ask the children each to read a sentence. Ask them to tell whether "=" or "≠" makes the sentence true.

Let them use the number line to show the sentence is true. For example, they may show the sentence 2 + 2 ≠ 3 + 6 like this:



Let the children say, "The line shows 2 + 2 = 4 and 3 + 6 = 9. The numbers 4 and 9 are not equal (≠). We know that the sentence is true." Let the children go on with the other sentences.

Also write sentences like these on the board.

10 + 3 = ☐ 12 + 5 = ☐

10 + 3 ≠ ☐ 12 + 5 ≠ ☐

Ask the children what numerals can be written in the boxes to make the sentences true. Let a child write a numeral in each box. He might write:

10 + 3 = 13

10 + 3 ≠ 16

Let the other children say whether the sentences are true.

True Sentences

Ask, "Do you know any other numbers that make the first sentence true? (No) Ask, "Do you know any other numbers that make the second sentence true?" If a child suggests a number, erase the numeral in the box and write the numeral for the number named. "Is the sentence true now?" Ask for other

numbers and continue to ask if the numbers make the sentence true. The children will say, "There are many numerals that make the second sentence true."

We can write any numeral in the box except "13" to make the second sentence true. The numeral "13" is the only numeral that makes the first sentence, $10 + 3 = \square$, true.

Work page 91 with the children. Be sure that they understand that in the "≠" exercises, many different numbers make the sentences true. Ask the children to do the exercises on page 92 in their exercise books. Let them make each sentence true. For those on the left of the page they write either "=" or "≠" in the space. For those on the right of the page they write a numeral in the box. (Note that a variety of answers is possible.)

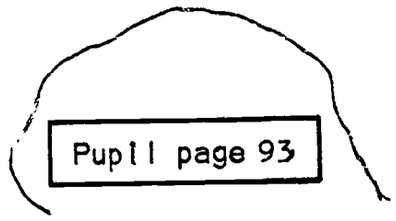
In some of the sentences on page 92 the children will use what they know about the commutative and associative properties of addition. For example, the children will know witnout adding that "=" goes in the space in this sentence:

$$5 + 2 \_\_ 2 + 5$$

They know that 5 + 2 and 2 + 5 are both numerals which name 7. They know that 5 and 2 are addends in each numeral. The order of the addends is changed. So "=" is the symbol which makes the sentence true. Another example from page 92 is this sentence:

$$(2 + 3) + 1 \_\_\_\_ 2 + (3 + 1)$$

In this sentence the children will see two numerals with the same three addends. The grouping of the three addends is changed. They know that does not change the sum. They know at once that the symbol needed is "=".



Activity 3: Equality and Inequality, review

Objective:

Children can differenciate between open sentences using the symbols "= and ≠" by demonstrating that the sentence using the symbol "=" can have only one numeral to make it true and the sentence using the symbol "≠" can have many different numerals that can be used to make it true.

Materials:

Pupil page 93

Equalities And Inequalities (=,≠)

Review the meaning of the symbol for "is equal to" (=) and the symbol for "is not equal to" (/). Place children in groups to illustrate following sentences.

18 - 8 ___ 12	16 - 7 ___ 10
15 - 10 ___ 5	10 - 10 ___ 0
16 - 2 ___ 17	14 - 7 ___ 5

Let the children in turn write either "=" or "≠" in the spaces so that the sentences are true. After a child writes a symbol let him read the sentence and say whether it is true.

Write some pairs of sentences on the board like the following

14 - 6 = ☐ 14 - 6 ≠ ☐

Ask a child to make each sentence true by writing a numeral in each box. After completing the sentences, let the children read both sentences and decide whether they are true.

Ask if anyone can put different numerals in the boxes so that the sentences are still true. Let several children try different numerals and read the new sentences.

The pupils will say after trying different numerals that only one number will make the first sentence true, but that many numerals can be written in the box in the second sentence to make it true.

True Sentences

Ask whether anyone can think of a numeral that can be written in both boxes so that both sentences will be true. If suggestions are made let the children try them out. They should see that there is no number that makes both sentences true.

Assign pupil page 93.

Word Problems for Unit 4

1. Linda had 12 pencils and lost 5 of them. How many has she left?
2. Mark had 10 apples and gave Ann 5. How many apples has he now?
3. Tom had 14 pieces of candy and ate 2 of them. How many pieces has he left?
4. Bill went to a new store. It was 4 blocks from his house. He walked 9 blocks. How many blocks too far did Bill walk?
5. Mary has 15 pennies. Linda has 19 pennies. What is the difference in the number of pennies that Mary and Linda have?
6. Tom has 17 pennies and Bill has 9 pennies. How many more pennies has Tom than Bill?
7. Mark had 13 toy airplanes and gave John 5 of them. How many did Mark have left?
8. Tom had 18¢ when he started to the store. n the way he lost 9¢. How many cents did he have left?
9. Susan picked 12 flowers. She gave 12 flowers to Mother. How many flowers did Susan have left?
10. Betty needs 18 cup cakes for her birthday party. Mother made 12 cup cakes. How many more cup cakes does Mother have to make?
11. Bill needs 17¢ to buy a baseball bat. He has 6¢. How many more cents does Bill need?
12. Susan wants to buy a puzzle which costs 15¢. She has 10¢. How many more cents does Susan need?
13. John had 18 toy soldiers. He gave Mark 10 of them. How many soldiers has John left?

14. Bill had 16 bottle caps. He lost 7 of them. How many has he now?

15. Tom saved 18 ice cream sticks. He gave John 4 of them. How many sticks has Tom left?

Note: These problems may be read to the class by the teacher. The children may answer orally, or they may write the correct number sentence for each problem. Additional problems should be used if desired.

UNIT 5

Weight, Time, and Money

OBJECTIVES:

1. To review the comparison of the weight of two objects. (heavier than and lighter than)
2. To introduce the pound as a unit of weight. (This object weighs less than a pound, about a pound, or more than a pound.)
3. To review reading the clock by the hour and extend to reading the clock to the half and quarter hour.
4. To introduce the idea of time and what happens at particular times a day.
5. To introduce the comparison of two periods of time. (This is a longer time or a shorter time than that.)
6. To review the recognition of coins and extend concept of value of money.

BACKGROUND INFORMATION FOR TEACHERS:

Children should be able to discover through comparing objects seen or not seen whether one object is "heavier than" another, is "lighter than" another, or weighs about the same as another. It is desirable that objects being compared not be seen if children are to make judgments about weight regardless of size.

To introduce the pound as a standard unit of weight, choose familiar objects that are measured in pounds. Let children compare these and be able to say, "This weighs more than a pound," "This weighs less than a pound," or "This weighs about a pound."

The activities suggested for telling time are ones that help children relate things they do to a specific time of day. This gives them a reason to read the clock to the hour, half hour, or quarter hour.

Review concept of the penny, nickle, and dime. Introduce concept of quarter, half dollar, and dollar. It is important that children know the different sets of coins and which coins are equal in value.

You should center all activities for the teaching of weight, time, and money around things the pupils do from day to day.

TOPIC I: WEIGHT

OBJECTIVE:

To review the concept of "heavier than" and "lighter than," by lifting objects of different weights, and to introduce the pound as a standard unit of weight by comparing the weight of other objects with that of the pound.

VOCABULARY: weighs, pound

MATERIALS: stones, cans with sand, small bags of sand, objects which weigh a pound (box of sugar or flour, block of wood), string, a large cardboard box, paper clips, pupil pages 94 - 96

Note: The general plan of this stage is (1) to review "heavier than" and "lighter than" by lifting pairs of objects; (2) to introduce the pound as a standard unit of weight; (3) to compare by lifting the weight of objects with the weight of an object that weighs a pound.

Teaching Procedure:

Activity 1: Reviewing "heavier than" and "lighter than"

Pupil page 94

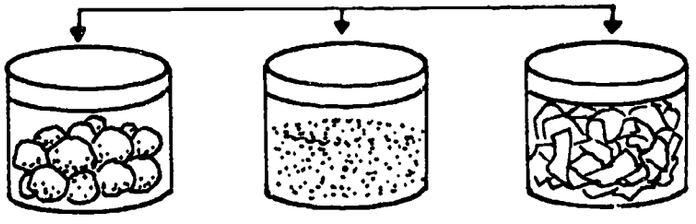
Objective:

Children can use the terms "heavier than" and "lighter than" to estimate the weight of objects.

Materials:

Three cans, stones, sand, waste paper, pupil page 94

Arrange various cans, marked A, B, C, and so on, that are filled with stone or sand and crumpled waste paper on your table. Fill the cans so that when they are lifted by the children there is a great difference in the weights of the cans. For example, see Fig. 1.



Judging Weight of Objects by Lifting

Let several of the pupils in turn lift a pair of the cans, one in each hand. They should move their hands up and down to feel the weight. Let them talk about which is heavier and which is lighter. Let several other children lift another pair of the cans and then talk about their weight and decide which is heavier. Ask other children to check whether they are right. Give each child a chance to lift a pair of cans and decide which is heavier.

After the children have lifted the cans, remove the cover so they may see what the cans contain. Let the children talk about why you covered the cans. (We might have known which was heavier by looking.) Let the children use pupil page 94 for additional practice.

Activity 2: Comparing the weight of two hidden objects

Pupil page 95

Objective:

Children can compare objects to determine which is heavier and which is lighter.

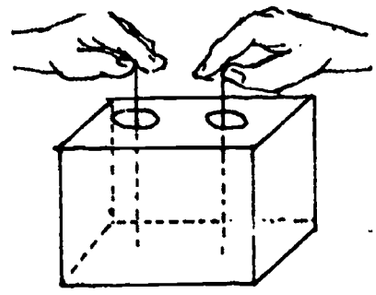
Materials:

Box 1' by 1' described below, string, several objects of varying weights, but at least two of the same weight, pupil page 95

Prepare a box like the one pictured on the following page to hide the objects. The box should measure at least 1 foot by 1 foot by 1 foot and have no bottom. Cut two 4-inch holes in the top and put a string through each. Tip the box forward and tie objects of different weights to each string. Do not let the children see what you have tied to the strings. This way they must rely only on lifting to decide which object is heavier.

Let several children lift the objects by the strings. Then let them together decide which object is heavier, and which is lighter. After they decide, show them the two objects

and let them lift them and again compare the weight of the objects.



Continue as needed with other pairs of objects. Use at least one pair of objects that weigh the same. Try to let all children have a chance to compare the weight of two objects in this way. More children can take part if you let several children lift the same objects before there is a decision about which object is heavier. To extend this concept have children compare objects they can see and then say, "This object is heavier than that one," or "This object is lighter than that one," or "These objects weigh about the same." Use the coat hanger balance to weigh different object., compare the weight of these objects, and record the comparisons such as weight of string, weight of a marble, weight of crayon, weight of cotton, etc. Let the children do pupil page 95 for reinforcement.

Activity 3: Introducing the pound as a unit of weight

Objective:

Children can estimate the weight of an object and state whether it weighs a pound, less than a pound, or more than a pound.

Materials:

A pound of sugar, wooden blocks, stones, pencil, paper, and a large book

Arrange on your table several articles such as a pound of sugar, a wooden block weighing a pound, other blocks of wood, stones of different weight, pencil, sheet of paper, and a large book. Among these articles should be some which weigh much more than a pound and some which weigh much less than a pound.

Hold up a pound of sugar (or other object which the pupils know weighs a pound). Say, "This is a box of sugar. It weighs a pound." Ask the class to repeat the word "pound" and to say, as they lift the bag, "The bag of sugar weighs a pound."

Let the children talk of articles in the stores which are sold by the pound. (Sugar, flour, butter, salt, rice) Let them also talk of their own weight.

Comparing Weight of Other Objects With That Of a Pound

Ask several pupils to lift the box of sugar in one hand and another object, say a stone, in another. Let them decide together whether the stone weighs more than a pound or less than a pound or about a pound. Continue in a similar way to let the children compare the weights of the objects on your table with the pound bag of sugar. Each time they should say, "This object weighs more (or less) than a pound," or "This object weighs about a pound."

Activity 4: Sorting objects by comparing with an object that weighs a pound

Pupil page 96

Objective:

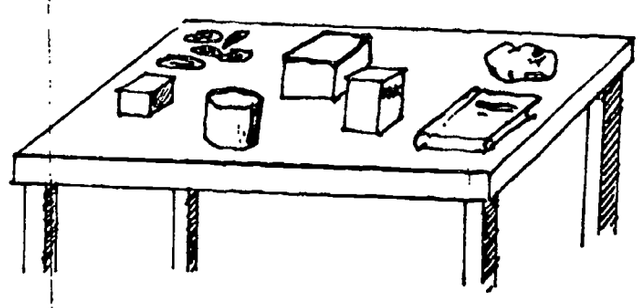
Children can sort objects into those that weigh "about a pound," "more than a pound", or "less than a pound."

Materials:

Same as Activity 3, pupil page 96

Again arrange many objects on your table, some which weigh more than a pound, some which weigh less and some which weigh about a pound.

Ask the children to compare the weight of each object with the weight of the pound bag of sugar by lifting. Let them separate the objects into three subsets. Let them put the objects that weigh about a pound in the center of the table, the objects that weigh more than a pound on one end, and the objects that weigh less than a pound on the other end of the table. See the figure below



Do pupil page 96.

TOPIC II: TIME

OBJECTIVE:

To review the concept of telling time by the hour and the half hour; to teach telling time by the quarter hour, the times that we do things, and duration of time.

VOCABULARY: half past, quarter past, longer time, shorter time, minute hand, hour hand

MATERIALS: large cardboard clock, a real clock, a large felt clock face, pupil pages 97 - 104, felt 5" by 5" squares (2), small individual clock faces

Teaching Procedure:

Activity 1: Time duration, longer time and shorter time

Objective:

Children can estimate time duration and discuss it in terms of which activity took "a longer time", "a shorter time", "the same time."

Materials:

A real clock

Ask pairs of children to do two different things. Let them begin at the same time and then discuss with the class which child took the longer time and which child took the shorter time. (Do not have a race.) Some of the things two children might do are these:

(1) One child walks around the classroom, another child walks around a chair.

Time Duration Group Activity

(2) One child goes outside the classroom and another child walks to the teacher's desk.

(3) One child takes 20 steps, another child takes one step.

After each pair of children has done as told let the pupils decide, "He took a longer time than she did," "She took a shorter time than he did," or "They took about the same time." Try to get all the children to take part in the activity.

Note: Extend concept of time by suggesting activities where the same task is performed by different children at different speeds. (Optional)

Activity 2: Measurement of duration - using the clock - hour, minute

Pupil page 97

Objective:

Children can measure time duration by the hour.

Materials:

Large cardboard clock, real clock, pupil page 97

Show the class a large demonstration clock or a real clock. Move the hands around the clock. Let the children describe the clock.

(1) It has a long hand which shows the passing of minutes. It is called the minute hand.

(2) It has a short hand which shows the passing of hours. It is called the hour hand.

(3) The clock face has numerals from 1 to 12. The hands move around the clock from 12 to 1, to 2, to 3, ... and to 12.

(4) The minute hand moves faster than the hour hand.

Illustrations with Cardboard Clock

Move the hour hand around the clock beginning at 7 o'clock in the morning. Let the children tell what they usually do at each hour of the day. For example, "At 7 o'clock in the morning I get up and eat. At 8 o'clock I come to school," and so on. Use pupil page 97 for added practice.

Activity 3: Using a clock to measure time duration.

What can I do in an hour; what can I do in a minute?

Objective:

Children can use a clock to measure time duration and realize that an hour is longer than a minute.

Materials:

A real clock

Let the children watch the hands of a real clock as they move. Observe which hand moves faster. Point out that one hand tells us about hours and the other tells us about minutes.

Ask the pupils to look at the clock at a particular hour, say 9 o'clock, and to remember everything they do in the hour from 9 o'clock to 10 o'clock. Remind them about every ten minutes that the hour is passing and let them say it is not yet 10 o'clock. When the clock reads 10 o'clock let the children tell all they

have done in the hour, for example, "We read from a book, we drew some pictures, we got a drink, and so on."

Ask them to watch the minute hand of the clock and to remember what they do in the next minute. When a minute has passed let them tell what they have done.

Let them talk about these questions: "Can you do more things in an hour or in a minute?" "Which is a longer time, a minute or an hour?" (They should decide an hour is a longer time than a minute.) "We can do many things in an hour and few things in a minute."

Activity 4: Telling time to the half hour

Pupil page 98

Objective:

Children can tell time to the half hour.

Materials:

A real clock, pupil page 98

Show the class a real clock. (A demonstration clock will do, but it is not as good as a real clock because the hands do not move together.) Move the hands from one hour to another as the class watches.

Say, "Pretend one hour passes as the hands move like this." Move the hands from one hour to the next. Discuss these questions: How far did the hour hand move? How far did the minute hand move? (The hour hand moved from 9 to 10. The minute hand moved all the way around the clock.) Continue in the same

manner to move the hands from 10 o'clock to 11 o'clock and on as needed.

Then move the hands from 9 o'clock to half past nine.

Half Hour

Ask, "Did this show that an hour passed?" (No) "How can you tell?" (The hour hand is half way between 9 and 10; the minute hand is half way around the clock.) Say, "When the hands are here we say it is half an hour past 9 o'clock, or half past 9 o'clock." Continue moving the hands around the clock. Let the children tell when it is 10 o'clock, half past 10 o'clock, 11 o'clock, half past 11 o'clock, and so on.

Ask the children, in turn, to fix the hands of their individual clocks at 10 o'clock; at half past 1 o'clock, and so on. Each time the hands are fixed call children, in turn, to tell what they do at that time of the day. Use pupil page 98 to reinforce concept of telling time to the half hour. (teacher-pupil activity)

Activity 5: Reading the clock to the quarter hour . Pupil page 99

Objective:

Children can read the clock to the quarter hour.

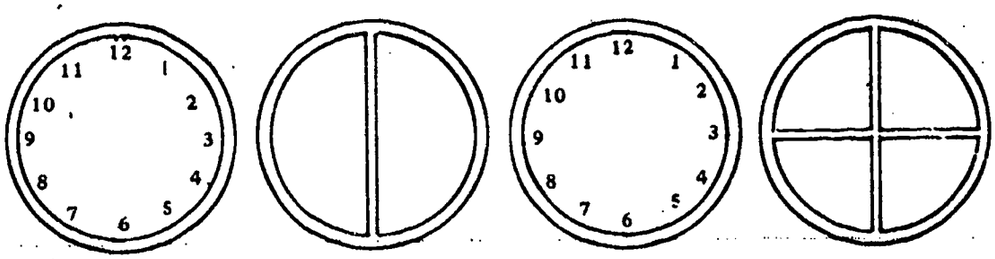
Materials:

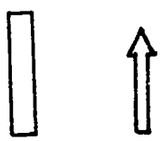
A clock, flannel board, flannel clock face, cutouts, and hour hand, pupil page 99

Show the class a real clock. Move the hands from, say 9 o'clock to half past 9 o'clock and then to 10 o'clock, and so on. Each time let the children tell the time the clock shows.

Quarter Hour

Begin again and this time stop the hands at quarter past 9 o'clock. Ask, "Is it 10 o'clock?" (No) "Is it half past 9 o'clock?" (No) "What part of the hour has passed?" (One fourth) "We say it is a quarter past 9 o'clock." Then place felt clock face on the flannel board like this: Place a felt circular shape divided in half, and another divided in fourths.





Quarter Hour

Ask the children to talk about the clock face being separated into four parts or into quarters. Place the felt hour hand at one. Use a felt stick for a minute hand. Place the felt stick to point to 12 and say, "This is the minute hand. What time does the clock read?" (1 o'clock) Move the minute hand to show half past the hour and ask, "What time does the clock read?" (Half past 1 o'clock) Move the hands to show three quarters past the hour and ask, "What time does the clock show?" Let the children talk about the time

the clock shows. Move the hands back to 1 o'clock and then around the clock again. With the children say, "1 o'clock; quarter past 1 o'clock; half past 1 o'clock; three quarters past 1 o'clock." Explain to the children that we say a quarter to 2 o'clock instead of three quarters past 1 o'clock. Change the hour hand to 2 o'clock and go through the plan again. Use a quarter to 3 rather than three quarters past 2. Change the hour hand and continue around the clock reading each quarter hour as needed. Change to the use of a real clock so the pupils can see the hour and minute hand move together. For additional practice have children do pupil page 99 by reading the picture story or reading the clock.

Activity 6: Using the clock (oral activity) Pupil pages 100 - 102

Objective:

Children can tell time by the hour, half hour, quarter hour.

Materials:

Two cardboard strips for each child, to be used as hands for clocks, pupil pages 100 - 102

Hour, Half Hour, Quarter Hour

Ask the children to turn to page 100 in their books. Give each of them two paper strips of different lengths to use as hands for the clock. You name times of day and let the children show these times by placing the hands on the clock face. Move around the room giving help as needed. Name times of day like these: 3 o'clock; quarter past 3 o'clock; half past 3

o'clock; a quarter to 4 o'clock; half past 7 o'clock.

Let children name times of day each quarter hour beginning at seven o'clock to noon, place their cardboard strips so that the clocks show that time, and tell what they do at that time of day. Ask the children to turn to pages 101 - 102 in their books. Name a clock face, for example, clock A. Let several children in turn read the time of day the clock shows. Let the pupils decide the correct time. Go on with the other clocks pictured.

Activity 7: A shopping trip

Pupil pages 103 - 104

Objective:

Children can tell time stories using hours, half hours, quarters hours, and minutes.

Materials:

Pupil pages 103 - 104

Tell the children that they are to pretend that today is Saturday and Susan and her mother are going on a shopping trip. Let the children find pictures about the trip on pages 103 and 104. Let them read the story the pictures tell and read the clocks which show the time.

The pictures were planned to tell the story below. However, allow the children to see other stories in the pictures and tell them.

Duration of Time

(1) At 7 o'clock Susan and her mother eat breakfast.

(2) At a quarter to 9 o'clock they leave the house to go downtown to buy Susan's shoes.

(3) At a quarter past 10 o'clock, they are at the snoe store and Susan can't decide which shoes she likes best.

(4) At a quarter to 12 o'clock they arrive home.

(5) At half past 4 o'clock Susan plays with her friends.

(6) At 6 o'clock Susan puts on her new shoes to show her father how well they fit.

Let the pupils tell what Susan did before leaving home for the store, what was bought at the store, what games they played, what they do after play, and so on. Let the pupils tell as many stories as possible from the pictures. They can also tell of their own shopping trips.

TOPIC III: MONEY

OBJECTIVES:

To review the names of coins (penny, nickel, dime, quarter, half dollar) and the dollar; to help children recognize and learn the value of and use of money.

VOCABULARY: the names of the coins (penny, nickel, dime, quarter, half dollar, dollar)

MATERIALS: real coins; paper coins; inch-square cards; picture cutouts of toys, sweets, and so on; any small inexpensive articles which could be bought in a shop; toy cash register; pupil pages 105 - 115

Teaching Procedure:

Activity 1: Recognizing and using coins

Pupil pages 105 - 112

Objective:

Children can recognize pennies, nickels, dimes, quarters, half dollars, and dollars and can select money to "purchase" certain items.

Materials:

Real or paper coins, pennies, nickels, dimes, quarters, half dollars, objects with price tags which coins will buy, pupil pages 105 - 112

Distribute real coins or paper coins to children. Let them show each coin and tell some things it will buy. Continue as needed.

Arrange a set of coins on your table. Ask children to choose a coin which will buy the articles you name, for example, an apple, a pencil, or a coloring book. As reinforcement use pupil pages 105 - 112 to help children in recognizing value of each coin.

Activity 2: Shopping games

Objective:

Children "sell" and "purchase" one or more items using one or more coins.

Materials:

Toy cash register, real objects or pictures of them, real or paper coins

Set up a classroom shop. Collect real objects or pictures of objects to sell in the shop. Choose children to be shopkeepers and buyers. Let a customer come and select two articles from the shop and pay for each, one at a time. Let the shopkeeper find the total cost of the two articles and show it on the cash register.

Use of Coins

Let a customer select an article that can be bought with one coin and pay for it with that coin. Let another customer choose the same article and pay for it with two or more coins. Let the shopkeeper hold up the two sets of coins and get the children to see that each set will buy the same article. Repeat this activity as needed.

Activity 3: Shopping activity

Pupil pages 113 - 115

Objective:

Children can select coins to "buy" pictured articles and can tell stories about this type of activity.

Materials:

Coins, pupil pages 113 - 115

Ask the children to find page 113 in their books. Let them tell what coin or set of coins will buy each article on the page.

Name a coin and let the children tell what things on the page can be bought with that coin. For example, "I can use a _____ coin to buy a banana."

Ask questions about buying two of the articles. For example, "What coins do you need to buy an orange and a fish?" How much money will I need to buy both balloons?"

Make up simple stories of shopping which children can think about. Some examples are:

(1) Joe wants to buy a fish and the eggs. Which costs more, a fish or the eggs?

(2) Lucy has a coin to buy a pencil and a jar of paste. Which costs more, a pencil or the paste?

(3) Jim wants a balloon. What coin does he need to buy it?

(4) Bill bought a banana with a dime. Mary bought a pear with a dime and a nickel. Did the pear cost more than the banana?

Let the children make up their own story problem for other children to think about and answer.

Activity 4: Store bingo

Objective:

Children can "purchase" items with various coins and determine whether they should receive any change.

Materials:

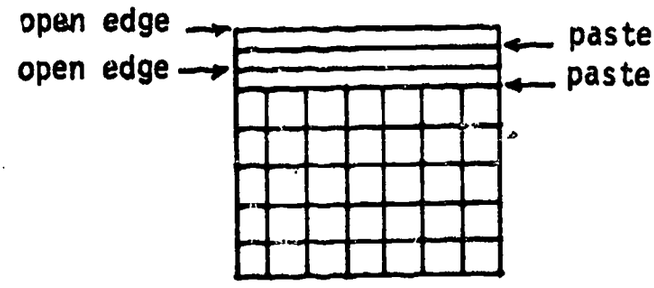
Store bingo cards, coins, picture cards, blank 2" by 2" cards

Directions for Bingo Card:

Cut tagboard into 5" by 7" cards.

Paste 2 (1/2" by 7") strips of tagboard across the top 1/2 inch

apart to form pockets. Mark off with a ruler 5 rows of 1 inch squares (7 squares in each row) See diagram below:



Place teacher-made pictures of items to be bought along first strip pocket and price signs on the second strip pocket. Give each child a Store Bingo card. Also give each child either 10 pennies, 2 dimes, 4 nickels, 3 nickels, a quarter, 1 half dollar, 2 half dollars, or a dollar bill. Ask, "What can you buy with a (mention coin desired)? Child might answer, "With a (mention the coin) I can buy (item or items of his choice)." Then he places his coins on the square in his card below the item he bought. Then ask the child if he is to receive any change. By looking at the price signs on the card and the coins he placed below the pictures he will be able to come to the right conclusion. Continue this line of questioning naming different coins. The object of the game is for children to spend all of their money by buying as many items as they can and to tell if they are to receive any change.

WORD PROBLEMS FOR UNIT 5

1. Tom's toy truck weighed 2 pounds. Ray's airplane weighed 1 pound. Which one is lighter? Tom's toy truck or Ray's airplane? How many pounds lighter?
   (Ray's airplane is one pound lighter.)
2. Molly's doll weighed 3 pounds. Jan's doll weighed 1 pound. Which doll is heavier? Molly's doll or Jan's? How much heavier?
   (Molly's doll is two pounds heavier.)
3. Bill was at school 2 hours in the morning and 3 hours in the afternoon. Was Bill in school longer in the afternoon or in the morning? How much longer?
   (The afternoon part is one hour longer.)
4. John picked some peaches which weighed 5 pounds. Bob's peaches weighed 6 pounds. Whose peaches weighed more? How much more?
   (Bob's peaches weighed one pound more.)
5. Mary's dog Jip weighed 20 pounds. Linda's cat, Puff, weighed 11 pounds. Who is heavier, Puff or Jip? How much heavier?
   (Jip, the dog, is nine pounds heavier.)
6. Ben weighs 45 pounds and Tom weighs 50 pounds. Who is lighter, Tom or Ben? How much lighter?
   (Ben is lighter by five pounds.)

Note: When problems about the clock are used, a clock should be before the children. After the answer has been given, the teacher should demonstrate it with a clock.

7. Betty gets up at 7 o'clock in the morning. It takes her 1 hour to get dressed and to eat breakfast. It takes 1/2 hour to get to school. What times does she get to school?

(8:30 a.m.)

8. Dora and Mary were helping their mothers. It took Dora 1/2 hour to wash and dry the dishes. It took Mary 1 hour to wash and dry the dishes. Who took longer to wash and dry the dishes? How much longer?

(Mary took 1/2 hour (30 minutes) longer.)

9. It takes Robert one half hour to walk to school. It takes George one quarter hour to walk to school. Who takes longer to get to school, Robert or George? How much longer?

(Robert took 1/4 hour (15 minutes) longer.)

10. Betty left school at 3 o'clock in the afternoon. She walked to Susan's house in one half hour. She played with Susan for one half hour. It took her one half hour to walk home from Susan's home. What time did Betty get home?

(4:30 p. m.)

11. Ann has 3 dimes, 2 nickels, and 3 pennies. How much money has she?

(43 cents)

12. Jane has 2 quarters. She needs 75¢ to buy a doll. How many more quarters does she need?

(One)

13. Ted needs 1 dollar to buy a toy airplane. He has a half dollar. How much more money does he need?

(50 cents, one half dollar)

14. Jill has a quarter, 3 dimes, and a nickel. Jerry has 3 dimes, 4 nickels, and 6 pennies. Who has the most money? How much more? (Jill has four cents more.)

UNIT 6

Numbers (Renaming Ones, Tens, Hundreds)

OBJECTIVES:

1. To review the idea of place value through hundreds.
2. To expand the idea of ordering numbers (1 - 999) using a number line.
3. To review counting by twos, fives, tens.

BACKGROUND INFORMATION FOR TEACHERS:

Review the stages in which pupils learn the techniques of computation. First they used objects and counted the objects in the union of sets. Then they counted the objects by tens which led to the idea of place value. Counting by 2's and 5's up to the 100 expands this idea.

TOPIC 1: COUNTING FROM 1 - 100 OBJECTS

OBJECTIVES:

1. To encourage an understanding of group counting from 1 to 100 by separating sets into subsets.
2. To develop the idea of odd and even numbers.

VOCABULARY: odd, even

MATERIALS: small objects for counting (bottle tops), hundred pocket chart, pupil pages 116 - 118

Teaching Procedure:

Activity 1: Separating sets into subsets

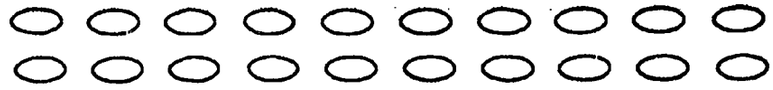
Objective:

Children can count by twos, fives, and tens.

Materials:

Counters

Arrange the class into small groups (about 5 or 6 per group). Give each group about 100 small objects to count. Ask the children to arrange their sets of objects in subsets, each of two members.



Counting by Twos

Let each group count their objects in twos as one child in the group moves the objects together two at a time. Then let the class count aloud by twos. Use the same procedure but use subsets of 5 members and subsets of ten members.

Activity 2: Odd and even numbers

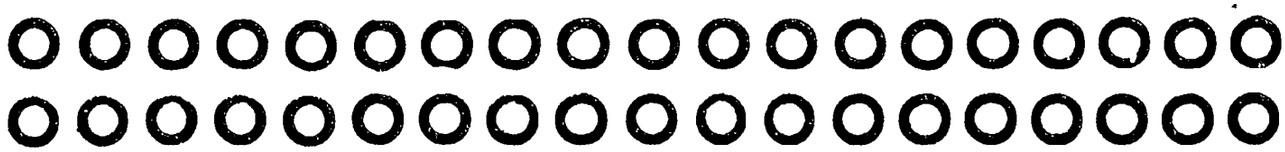
Objective:

Children can count by twos and threes and know the difference between odd and even numbers.

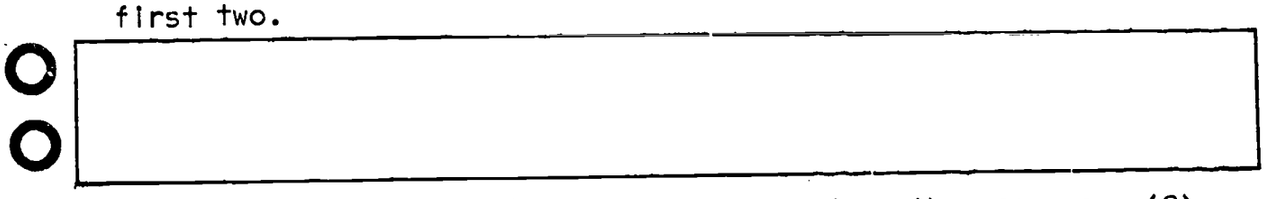
Materials:

Objects for counters, strip of cardboard

Draw a pattern of counters on the chalkboard as follows or have it prepared on a strip of cardboard:



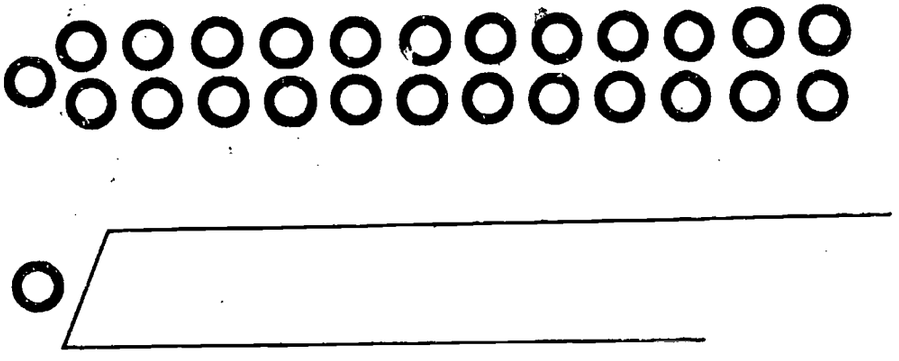
Use a strip of paper to cover all the counters except the first two.



Ask the children to tell you how many counters they can see. (2) Move the paper to show two more counters and ask the children to tell you how many they now see. Keep showing two more counters each time as the class counts by twos.

Tell the class that the numbers that they use when they count by twos are called <u>even</u> numbers. Ask the children to name an even number. Reverse the activity by starting with the whole pattern uncovered. Keep on hiding two counters at a time while the children count back by twos. (They will be counting backward by twos.)

Add 1 counter to the pattern of counters drawn on the board. Cover all except one counter with the strip of paper.



Ask the class to say how many counters they can see. Move the paper to uncover two more counters. Ask, "How many counters

can you see now?" (3) Keep moving the paper to show two more counters each time while the children count: "One, three, five, seven," and so on. Tell the class that the numbers that they use when they count in this way are called odd numbers. Ask the children to name any odd numbers they can.

Activity 3: Identifying sets which have an even or odd number of members

Objective:

Children can count an even and an odd number of objects.

Let children name sets in their classroom and count the members of the sets by twos. Get them to tell which sets have an even number of members and which have an odd number of members.

Activity 4: Counting by twos and fives on the Hundred Pocket Chart

Objective:

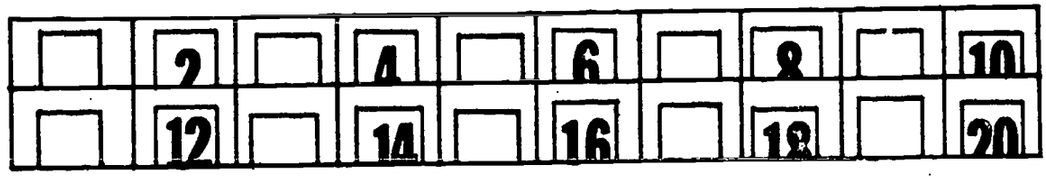
Children can count by twos and fives to one hundred using a number chart.

Materials:

Hundred pocket chart

Hang the hundred pocket chart in front of the class. Let the blank sides of the cards show. Get the children to say what numeral is written on each second card as you point to it. Point to the second card; turn it over. In a similar

way turn over the fourth, sixth, and so on. Continue until you reach the 20-card. The chart will look like this:



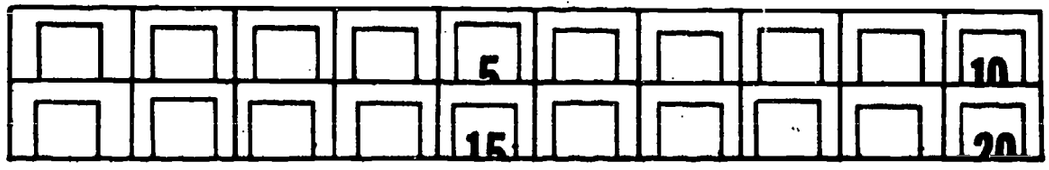
Let the children read what they see on the cards. Ask, "What do we call these numbers?" (even) Ask, "What is the next even number?" (22) Let a child turn that card over. Ask the children, in turn, to turn over any card that has a numeral for an even number. They will see that the numerals for even numbers form a pattern. They may say that all the numerals for even numbers end with 0, 2, 4, 6, or 8.

Let the class tell the numerals on the cards that are hidden. Point to the cards in turn as the class counts: "1, 3, 5," and so on. Ask, "What are these numbers called?" (Odd)

Again turn all the cards in the chart so that the blank sides show. Begin with the 1-card and point to each card, in turn, as the class counts, "1, 2, 3, 4, 5". Stop and turn the 5-card over. Point to the next card and say, "One". Let the class count "1, 2, 3, 4, 5" again as you point to the cards in turn. Stop when they say, "five" and turn the 10-card over. Continue in this way, turning over every fifth card with the

Pocket Charts (by Fives)

children counting "1, 2, 3, 4, 5" each time. When you have reached "40", allow the children to come out and turn over cards in the same way.



Let the class read aloud what they see on the cards. Say, "We use these numbers to count by fives." With their eyes closed get the children to repeat the numbers used to count by fives. (Optional)

Let some of the children who can, repeat this activity by other groups, for example, by threes or fours.

Let them find patterns formed by the numerals on the chart. For example, when they count in threes they will make a chart like this.

		3			6			9	
	12			15			18		
21			24			27			30
		33			36			39	
	42			45			48		
51			54			57			60
		63			66			69	
	72			75			78		
81			84			87			90
		93			96			99	

Here the numerals form sloping lines. They will remember that the numerals for even numbers formed vertical lines.

Activity 5: Counting by twos on a number line

Objective:

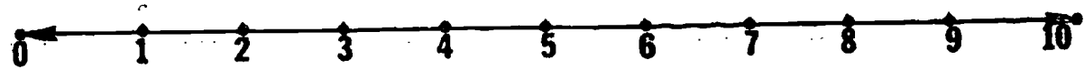
Using a number line, children can count by twos to 24 or 25.

Materials:

Number line

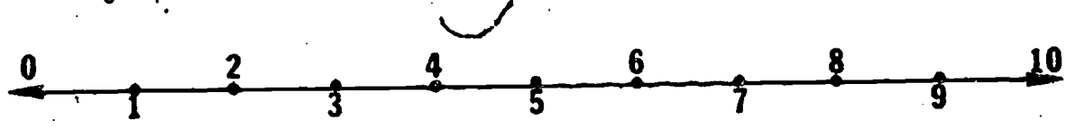
On a prepared number line taped on the floor let the children write the numerals on it.

Mr. Frog Game



Tell the class that Mr. Two Frog is jumping along this line. He jumps two spaces every time. He starts at point "0". Ask a child to show the class where Mr. Two Frog lands with each jump (2, 4, 6, 8, and so on) -- by moving along the number line.

On a second number line below the first let the children write in the numerals (using chalk) on which the frog lands as he jumps.



Let the pupils together say the numbers used with the line. Ask them what these numbers are called, odd or even.

Use different number lines starting at different points such as 1 or 25 and have Mr. Two Frog jumping two spaces. Let the children fill in numerals as before. Ask them if these

numbers are odd or even. Help them to understand that the part of the number line they use can be started at 2, at 25, or at any number.

On another number line, write "1" above the second point. Tell the children, "This time Mr. Two Frog is going to start at one." Let the children write in the numerals where Mr. Two Frog lands. Ask what the numbers these numerals represent are called, odd or even.

On still another number line, write "25" above the first point. Tell the class that Mr. Two Frog is still jumping two spaces each time but he is starting from the 25-point. Let the children fill in the numerals as before. Help them to understand that the part of the number line they use can be started at 2, at 25, or at any number.

Activity 6: Counting by twos and fives on a number line

Objective:

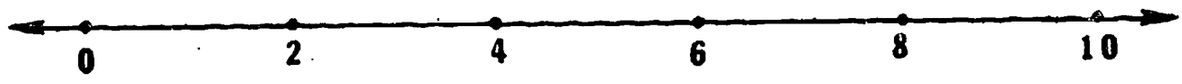
Using a number line, children can count by twos and fives to 20.

Materials:

Number line

Two and Fives

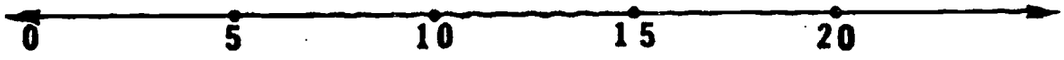
Tape a prepared number line on the chalkboard. Tell the children that this time they will mark only those points where the frog lands each time.



Mark the first point "0" and the next point "2". Tell the class that the frog started from "0" and jumped to "2". Point to the next mark, "2", and say that is where he landed. Ask the class what numeral should be written above the next point. (4) Let the children fill in the rest of the numerals for even numbers.

Draw another number line. Mark the first point "0" and the next point "5". Say, "Mr. Five Frog uses this number line." Ask, "What numeral must we write above the next point?" (10)

Draw other number lines. Sometimes start with numbers other than zero. Sometimes start from the right end, as below.



Let the children fill in numerals on the line as they count back by fives.

Activity 7: Filling in missing numbers on number lines

Pupil pages 116 - 118

Objective:

Children can fill in missing numbers on number lines.

Materials:

Pupil pages 116 - 118

Ask the children to turn to pages 116, 117, and 118 in their books and to fill in the missing numerals. Ask the children as you talk with them to tell you what number they are counting by as they work on each number line (that is, how far

the frog jumps each time). Ask others to point to the numerals for odd and even numbers.

Activity 8: Filling in missing number in number sequences

Pupil page 119

Objective:

Children can use a number chart to fill in missing numbers in a number sequence.

Materials:

Pupil page 119

Ask the children to turn to page 119 in their books. Let the children talk about the sequences of numbers on the page. Let them fill in sequences in their work books and fill in the missing numbers. Suggest the children use the number chart on page 119. Ask each child questions about his work. For example, "Are you counting forward or back in this row of numerals?" "By what number are you counting in each row?" Help children having difficulty by showing them how to use the number chart to fill in a sequence.

TOPIC 11: COUNTING BY TENS AND HUNDREDS

OBJECTIVE:

To expand the concept of counting by tens and hundreds through recognition of patterns of counters from 1 to 1000 and the separation of sets into subsets of ten members and 100 members.

VOCABULARY: hundred, least

MATERIALS: a large supply of sticks used in previous activities, string or rubber bands to tie the sticks in bundles, cardboard cutouts (one per child, see Activity 2), pupil page 120

Teaching Procedure:

Activity 1: Sticks (20 per child)

Objectives:

1. Children can compare a number of sticks using the terms "most" and "least".
2. Children can count by ones, tens, and hundreds to one thousand.

Arrange the class in groups of 4 or 5 children. Place a large pile of sticks (about 20 per child) on a table in front of the class. Ask, "Can you guess how many sticks are in this set?" Let the children write their guesses on the board. Ask, "How can you find out how many sticks there are?" Tell the class they all can help find the number of sticks.

Ask one child to separate the set of sticks into subsets, one subset for each group of children. Tell him to put about the same number of sticks in each set but not to count. Let each group separate their set of sticks into smaller subsets and give one subset to each child. It is better if the subsets do not have the same number of members. Let the children separate the sets without counting.

Let each child count his sticks and tie them into bundles of ten. Ask how many each child has. Let children, in turn,

write their answers on the board. Let children check each others' work. Ask questions such as: "Which person in this group has the most sticks?" "Who has the least number of sticks in this group?" "Has Jose more sticks than Maria?" Let one child in each group count his sticks while the others in the group watch, listen and check. Ask the children to use two possible ways of counting:

Most, Least

"One ten, two tens, three tens, three tens one, three tens two, ... "

And then,

"Ten, twenty, thirty, thirty-one, thirty-two, ..."

Let the children in each group place all their sticks in one large pile. Let them discuss how they can find the number of sticks in this set, count the sticks, and write the number of sticks on the board. Choose one child from each group. Let him explain to the class how his group has found the number of sticks. Some of the children will be able to say the number of sticks is, for example, "16 tens 8 ones", and be able to write correctly "168". The correct answer to the question "How many sticks?" is in this case one hundred sixty-eight.

Practice with tens

Ask questions to help the children know that ten bundles of ten sticks each can be bundled together to form a larger bundle of one hundred sticks. Ask one group how many bundles of ten they had when they put all the sticks together? Ask, "How many single sticks did you have when you put all your sticks together?" If the group says that there were, for example, 15 sticks, ask, "What must you do if there are more than ten

sticks when all the sets are joined together?" (Tie them into bundles of ten)

"What is another name for ten ones when they are bundled together?" (One ten)

"What is another name for two tens?" (Twenty)

Hundreds "What is another name for three tens?" (Thirty), and so on.

"What is another name for ten tens?" (One hundred)

"What can you do when you have ten single sticks?" (Make a bundle of ten)

"What can you do when you have ten bundles of sticks?" (Make a big bundle of ten bundles)

"How many sticks are in this big bundle?" (One hundred)

Let each group tie their bundles of ten into hundreds and count their sticks in both these possible ways:

"One hundred, one hundred ten,..., one hundred, two tens, four ones,...,"

"One hundred, one hundred ten,..., one hundred twenty-four, ...,"

Let all of the groups join their sets together on the table in front of the class. Let them place the set of hundreds, the set of tens and the set of ones in separate piles. There will probably be more than ten single sticks and more than ten bundles of ten. Ask a child to tie these into bundles of ten and bundles of one hundred.

While one child points to the bundles in each pile, let the class count together, for example, "One hundred; two

hundreds,...; eight hundreds, one ten two ones,..." Let them also count the sticks as "One hundred; two hundred,...,eight hundred ten; eight hundred eleven; eight hundred twelve,..., and so on."

Check now on the guesses of the number of sticks that were made at the beginning of the activity. Ask the class to tell how they found the number of sticks.

Activity 2: Recognizing patterns of counters, 1 to 100 **Pupil page 120**

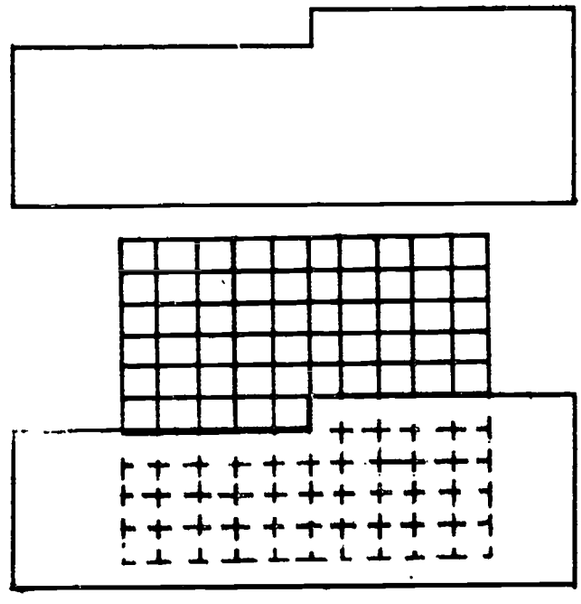
Objective:

Children can count by tens, hundreds, and thousands by using a hundred squares chart.

Materials:

One cardboard shape for each child, (illustrated below), one large cardboard shape, one large sheet with 100 squares, pupil page 120 (Note: pupil page 120 is also used in the next topic.)

Each child requires a small piece of cardboard or stiff paper cut in this shape:



Further Practice

Ask the class to find page 120 in their books. Let the pupils talk about what they find. Below are some of the many simple activities which you can help the pupils do with this page as they cover and uncover part of the squares.

a. Ask the children how many squares there are on the whole page. Help them to see that there are ten squares in each row, a hundred squares in all, and a thousand squares on the page.

b. Let the children count by hundreds as they uncover the appropriate number of squares of a hundred squares with their counters.

c. Ask such questions as, "How many tens in one hundred?" "How many tens in two hundred?"...

d. Let the pupils count by fives and tens as they move their cardboard cutouts to cover parts of the page.

e. Say a number and ask the children to show that number of squares. Let children work in pairs, one child checking the answer of the other.

f. Let several children stand together in front of the class showing their pages of one hundred squares. Let the children count by tens.

Note: A large sheet of paper with a pattern of one hundred squares can be pinned on the wall for class use. Make a large cutout to use with it. For example, show a certain pattern of counters and ask the class to tell you the number of counters.

TOPIC III: WRITING NUMERALS FOR NUMBERS GREATER THAN ONE HUNDRED

OBJECTIVE:

To teach children to recognize, read, and write numerals greater than one hundred.

MATERIALS: counting sticks, a number tray, three sets of 5" by 7" numeral cards, pupil pages 121 - 125

Teaching Procedure:

Activity 1: Recognizing the numerals 100 - 999

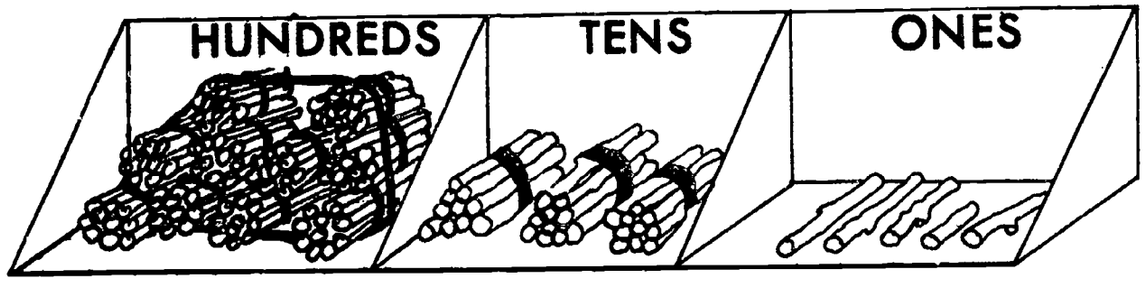
Objective:

Children can represent 3 digit numerals with single sticks, bundles of ten sticks, and bundles of one hundred sticks in a number tray.

Materials:

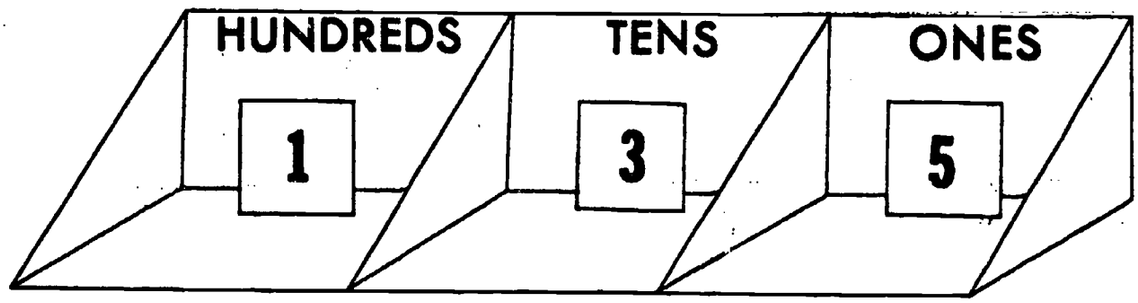
Bundles of hundred sticks, bundles of ten sticks, single sticks, number tray, numeral cards

Repeat the experiences of Topic II by letting children organize a large set of sticks into bundles of tens and bundles of hundreds (ten bundles of ten sticks each). Place the number tray in front of the class. Ask in which place the single sticks go, and where the bundles of ten sticks are placed. Review previous work with tens and ones if necessary. Now ask where the bundle must be placed.



Ask a child how many ones sticks there are in the tray. Tell him to choose the numeral card which shows that number and put it in the tray. Let other children place numeral cards in the other two places to show the number of tens and hundreds.

The number tray should now look like this:



Change the number of sticks in the tray many times and repeat the activity. Be sure to arrange the sticks so that the numeral "0" must be used, for example, when there are no tens or ones in the tray. After each new set of numeral cards has been placed in the tray, let the class read numerals on the cards aloud. Ask them how many sticks are in the tray. Get someone to write this on the board.

Reverse the activity.

Write a three-digit numeral, for example, 172, on the board. Ask a child to set up the number tray as in the diagram above to show this number. Let another child replace the numeral cards by the correct number of bundles and single sticks.

Activity 2: Writing the numerals, 100 - 999 | Pupil pages 121 - 122

Objective:

Children can write three digit numerals under the headings, "hundreds, tens, and ones."

Materials:

Same as Activity 1, pupil pages 121 and 122

Numerals 100 - 999

Ask the children to turn to page 121 in their books. Let them set up the number tray with numeral cards to show the first exercise. Ask a child to replace the cards with correct number of sticks. Let the pupils write the correct numerals under the headings HUNDREDS, TENS, AND ONES. Talk about the exercises where no number of tens and ones are given. When necessary, use the number tray to show that numeral "0" must be used when such numbers are named.

Let the children name each number as they make the sentences true on page 122.

Decide whether children really understand this activity by asking them to show their answers on the number tray.

Activity 3: Practice with three-digit numerals | Pupil pages 123 - 124

Objective:

Children can write the numerals to 999 under the headings "hundreds, tens, and ones."

Materials:

Pupil pages 123 and 124

Three-digit Numerals

Ask the children to turn to page 123 in their books. Ask them to read the first exercise as "one hundred and forty and five", and then as "one hundred forty-five", and then as one hundred four tens and 5 ones. Let them tell what goes under "hundreds", "tens", and "ones" in the exercise. Let the children write the numerals for the numbers in their work books, and let them set up the number tray as in Activity 1. Pupil page 124 may be used for additional practice.

Activity 4: (Optional Activity) Showing numerals with cards

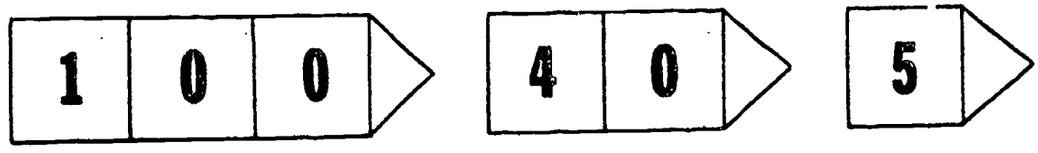
Objective:

Children can use numeral cards to build numerals from 1 to 999.

Materials:

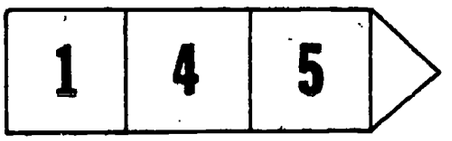
Tagboard for making numeral cards described below

Let the children make sets of cards for 100-900, 10-90, and 1-9 like the ones shown below. (The squares should be about 1 inch by 1 inch which results in the three place numeral having cards three inches wide, the two place numeral having cards two inches wide and the one place numerals having cards one inch wide. The cards, therefore, overlap when combined to name various numbers.



Overlapping Numeral Card

Let the children show numerals by combining the cards. For example, by placing the "5" card on top, the "40" card next and the "100" card in back, "145" can be formed.



When the cards are combined in other ways, the numerals 45 and 105 also can be formed. With the set of twenty-seven cards, 1-9, 10-90, and 100-900, the children can build any numeral from 1 to 999. Let them work in pairs with one child naming a number and the other showing the numeral for the number with his cards.

Activity 5: Changing tens to hundreds and tens

Pupil page 125

Objective:

Children can regroup a number of sticks to represent different names for the same number.

Materials:

Seventeen bundles of sticks, pupil page 125

Tens to Hundreds

Place 17 bundles of ten sticks in the number tray in front of the class. Put all these bundles in the tens part of the tray. Ask, "How can we regroup these bundles?" (Tie ten bundles of tens into one bundle of one hundred) Ask, "Where does the bundle of one hundred go?" (In the hundreds part) This will help the children to see that "17 tens" names the same number as "1 hundred and 7 tens".

The exercises, "1 hundred and 3 tens = _____ tens," can be shown as follows: place a one hundred bundle and three tens bundles of sticks in the number tray in the correct parts. Ask the children how many tens there are altogether. Remove the string from the hundred bundle and place the resulting ten bundles of tens in the tens part of the tray. Ask the children how many tens there are now.

Emphasize that: (1) The number of sticks has not changed but the way in which the sticks are grouped has been changed; (2) Each time the set of sticks is regrouped, the number of sticks in the set is renamed.

Show with a number tray that the number of sticks in a set can be given several different number names. Use the example below:

316 = 3 hundreds and 1 ten and 6 ones

316 = 31 tens and 6 ones

316 = 3 hundreds and 16 ones

316 = 316 ones

Let the class say, "These are all names for the same number." Ask the children to complete exercises on page 125.

TOPIC IV: DEVELOPING NUMERICAL SEQUENCES (1 TO 999)

OBJECTIVE:

To develop the concept of number sequence.

MATERIALS:

999 popsicle sticks, number tray, counters

Teaching Procedure:

Activity 1: Developing numerical sequences (1 to 999) | Pupil pages 126-129

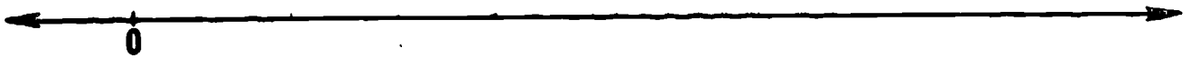
Objective:

Children can count sequentially with the aid and use of the number line from 1 to 999 by ones, twos --- tens, hundreds.

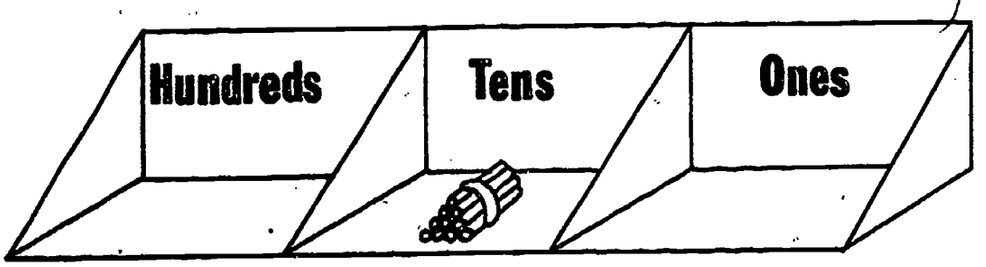
Materials: counting sticks, number tray, pupil pages 126-129

(Note: Refer, if needed, to counting by twos, and fives, pages 224-230.) Following this plan:

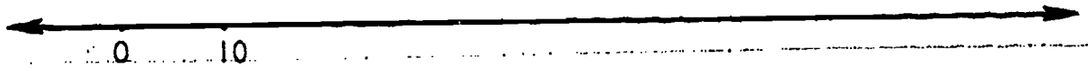
Draw a number line on the board and label the point zero. Say, "We are going to use the number line in a new way. We are not going to label points for all the whole numbers because we will want to show points for some large numbers and we could not draw enough of the line."



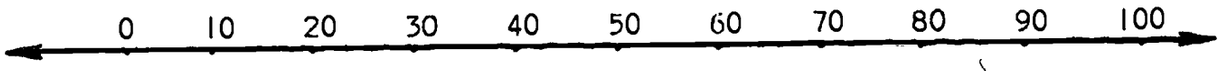
Have a child place one bundle of ten sticks in the tens' part of the number tray. Ask "How many members has this set of sticks?" (10)



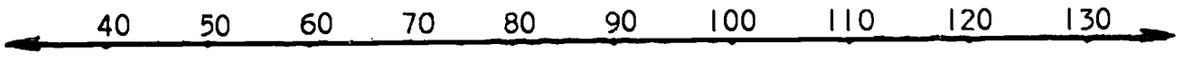
"Suppose we label the first point to the right of zero as 10, to show we put 10 sticks in the tray." Label the number line as shown. "If we had put in just 1 stick where would the point be?" (Very close to zero)



It should be made clear to pupils that the "10" on the number line denotes the number of units or the number of sticks presently in the tray. Have another child place a tens bundle of sticks in the tens' part of the number tray and tell how many sticks there are now. (20) Ask him to identify and label the point on the number line which would show this number of sticks. (Be sure the student chooses the same unit length as the earlier child.) Repeat this procedure to 100.

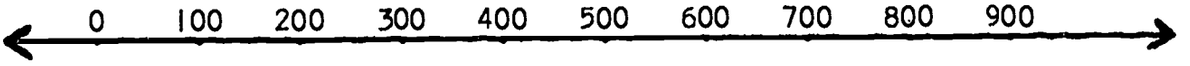


Draw another number line on the board. Put 4 bundles of ten sticks into the tens' part of the number tray and tell the children you choose to begin with 40 sticks this time. Label the point "40" on the number line. Then have children add bundles of ten to the number tray as was done earlier. Label the new sums accordingly until 130 sticks have been placed in the tray.

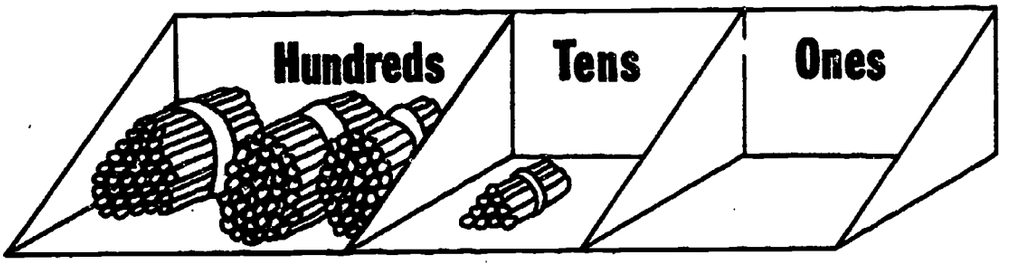


The students should already be familiar with counting by ones, twos, and fives from previous activities in this unit; however, they should now be able to recognize the nature of the number sequences as 4, 6, --; 0, 10, 20, --, etc. The use of the number line aids the student to gain a mental image of each sequence considered.

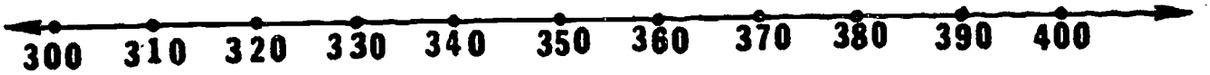
Draw another number line. Put bundles of hundreds in the number tray, beginning with one, two, etc. Let the class read the numerals as you indicate them on the number line, 0, 100, 200, . . ., ending with 900.



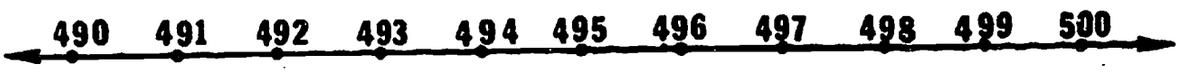
Draw another number line. Put 3 bundles of hundreds in the tray. Write "300" above the first point. Put a



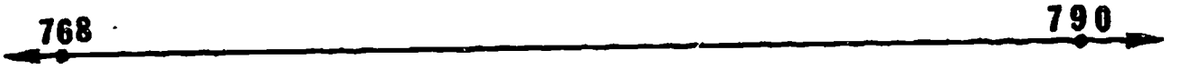
bundle of ten sticks on the tray and ask, "How many sticks are there now?" (310) Let a child write "310" above the next point. Continue putting bundles of ten in the tray until 390 is reached. When another ten is put in, there will be ten bundles of ten in the tens part of the tray. Ask the class what regrouping must be done. (Tie them into a bundle of a hundred sticks) Repeat the question, "How many sticks are in the set now?" (400) Write "400" in the line.



Repeat this activity, using the number tray to help build up number lines like the one below.



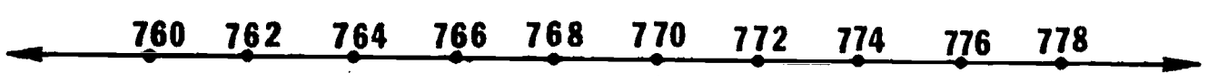
(Begin with 490 sticks and put one stick in the tray at a time. When 500 is reached, ten sticks must be tied into a bundle and ten tens must be tied into a bundle of a hundred.)



(Begin with 768 sticks and put two sticks in the tray at a time.)

After each number line is made, let the children read the numbers from the line.

Vary the activity by starting at the last point on the line and removing sticks from the tray. For example,



Vary the activity by starting in the middle of a number line and build the line in both directions.

Note: It is not necessary to use the number tray to help build the number lines if the children understand the number line without the use of the tray.

Ask the children to turn to pages 126 - 129 in their books. Let them write the missing numeral on the number line counting by ones, twos, fives, tens, or hundreds.

Activity 2: Recognizing patterns of counters

Pupil page 120

Objective:

Children can count to 999 using the hundred squares chart and covering up a certain number of squares each time.

Materials:

Cardboard cutouts, pupil page 120

Ask the children to turn to page 120 in their books. Let them use the cutouts as they did in Topic II, Activity 2.

Ask the pupils to use their cutouts to cover part of the squares to show a pattern of 300 squares. Ask them to move

their cutouts to show two more squares. Ask, "How many squares can you see now?" Let them keep moving their cutouts to show two more squares each time. Let them say the number of squares which are uncovered after each move. They will now be counting by twos, 300, 302, 304, and so on.

Vary this activity by starting with another number of squares and by changing the number of squares to be uncovered each time. Each time let the children count aloud. Let them also count backwards by covering up a certain number of squares each time.